This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

NEDL TRANSFER
HN 57UX T

KH 372

THE NEW INTERNATIONAL ENCYCLOPÆDIA

EDITORS

DANIEL COIT GILMAN, LL. D.
PRESIDENT OF JOHNS HOPKINS UNIVERSITY (1876–1901)
AFTERWARDS PRESIDENT OF THE CARNEGIE INSTITUTION OF WASHINGTON

HARRY THURSTON PECK, PH. D., L. H. D.
PROFESSOR IN COLUMBIA UNIVERSITY

FRANK MOORE COLBY, M. A.
LATE PROFESSOR OF ECONOMICS
IN NEW YORK UNIVERSITY

VOLUME VI

NEW YORK
DODD, MEAD AND COMPANY
1909

KH 372

HARVARD COLLEGE
May 12, 1941
LIBRARY

Mrs. T. W. Richards

Copyright, 1903, 1904, 1905, 1906, 1907
BY DODD, MEAD AND COMPANY

All rights reserved

PRESSWORK BY THE UNIVERSITY PRESS, CAMBRIDGE, U. S. A.
BINDING BY BOSTON BOOKBINDING CO., CAMBRIDGE, U. S. A.

ILLUSTRATIONS IN VOLUME VI.

COLORED PLATES

FACING PAGE
OCTOPODS AND DECAPODS 38
DECORATIVE ART (Pompeian Mural Decoration) 52
DRAGON FLIES 426
DRUPES 478
DUCKS, DOMESTIC 496
EGGS—AMERICAN SONG BIRDS 676
EGGS—AMERICAN WATER AND GAME BIRDS 678

MAPS

DELAWARE 86
DENMARK 126
DENVER 136
EAST INDIA ISLANDS 602
ECUADOR 636
EGYPT 688

ENGRAVINGS

DECLARATION OF INDEPENDENCE 46
DEEP-SEA EXPLORATION 60
DEER OF NORTH AMERICA 62
FALLOW DEER, MUSK, ETC. 63
DELACROIX, EUGÈNE ("The Bark of Don Juan") 80
DEMOSTHENES 120
DESERT PLANTS 158
DIAMONDS 200
DICOTYLEDONS 218
DICOTYLEDONS 219
DINOSAURS 258
DIPNOI AND CHIMÆRA 274
DISEASE GERMS 290
DISTRIBUTION OF ANIMALS—Physical Features of the Earth 310
DISTRIBUTION OF ANIMALS—Zoögeographical Regions 311
DOGS, HUNTING AND WATCH 352
DOGS, TERRIERS, SPANIELS, ETC. 354

FACING PAGE
DOGWOOD TREE 358
DOLCI, CARLO ("The Magdalen") 360
DONATELLO ("St. George") 384
DOW, GERALD 404
DREDGES 452
DUCKS, NORTH AMERICAN WILD 494
DUNES 522
DÜRER, ALBERT ("Hieronymus Holzschuher") 540
DURHAM CATHEDRAL 544
DYNAMO-ELECTRIC MACHINERY 564
DYNAMO-ELECTRIC MACHINERY 565
DYNAMO-ELECTRIC MACHINERY 566
EAGLES AND HAWKS 576
ECHINODERMATA 620
EDELWEISS, ETC. 640
EDFU—TEMPLE OF HORUS 642
EELS, CONGERS, AND MORAYS 672
EGYPTIAN DEITIES 698
EGYPTIAN ARCHITECTURE—TEMPLE AT PHILÆ 708
EGYPTIAN ART—COLOSSAL STATUE OF RAMESES II. 710
ELECTRIC FISH 750
ELECTRIC LOCOMOTIVES 774
ELEPHANTS 788
ELEPHANTA 790
ELEVATORS 792
ELIZABETH, QUEEN 804

KEY TO PRONUNCIATION.

ā	as in ale, fate. Also see ĕ, below.
ā̇	“ “ senate, chaotic. Also see ĕ, below.
â	“ “ glare, care.
ă	“ “ am, at.
ä	“ “ arm, father.
ȧ	“ “ ant, and final *a* in America, armada, etc. In rapid speech this vowel readily becomes more or less obscured and like the neutral vowel or a short u (ŭ).
a	“ “ final, regal, where it is of a neutral or obscure quality.
a̤	“ “ all, fall.
ē	“ “ eve.
ē̇	“ “ elate, evade.
ĕ	“ “ end, pet. The characters *ĕ*, *ā*, and *ā̇* are used for *ä* in German, as in Gärtner, Gräfe, Hähnel, to the values of which they are the nearest English vowel sounds. The sound of Swedish *ä* is also indicated by *ĕ*.
ẽ	“ “ fern, her, and as *i* in sir. Also for *ö*, *oe*, in German, as in Göthe, Goethe, Örtel, Oertel, and for *eu* and *oeu* in French, as in Neufchâtel, Crèvecœur; to which it is the nearest English vowel sound.
e	“ “ agency, judgment, where it is of a neutral or obscure quality.
ī	“ “ ice, quiet.
ī̇	“ “ quiescent.
ĭ	“ “ ill, fit.
ō	“ “ old, sober.
ō̇	“ “ obey, sobriety.
ô	“ “ orb, nor.
ŏ	“ “ odd, forest, not.
o	“ “ atom, carol, where it has a neutral or obscure quality.
oi	“ “ oil, boil, and for *eu* in German, as in Feuerbach.
o͞o	“ “ food, fool, and as *u* in rude, rule.
ou	“ “ house, mouse.
ū	“ “ use, mule.
ū̇	“ “ unite.
ŭ	“ “ cut, but.
ụ	“ “ full, put, or as *oo* in foot, book. Also for *ü* in German, as in München, Müller, and *u* in French, as in Buchez, Budé; to which it is the nearest English vowel sound.
û	“ “ urn, burn.
y	“ “ yet, yield.
B	“ “ the Spanish Habana, Cordóba, where it is like a *v* made with the lips alone, instead of with the teeth and lips.
ch	“ “ chair, cheese.
D	as in the Spanish Almodovar, pulgada, where it is nearly like *th* in English then, this.
g	“ “ go, get.
G	“ “ the German Landtag, and *ch* in Feuerbach, buch; where it is a guttural sound made with the back part of the tongue raised toward the soft palate, as in the sound made in clearing the throat.
H	as *j* in the Spanish Jijona, *g* in the Spanish gila; where it is a fricative somewhat resembling the sound of *h* in English hue or *y* in yet, but stronger.
hw	“ *wh* in which.
K	“ *ch* in the German ich, Albrecht, and *g* in the German Arensberg, Mecklenburg; where it is a fricative sound made between the tongue and the hard palate toward which the tongue is raised. It resembles the sound of *h* in hue, or *y* in yet; or the sound made by beginning to pronounce a *k*, but not completing the stoppage of the breath. The character K is also used to indicate the rough aspirates or fricatives of some of the Oriental languages, as of kh in the word Khan.
n̲	as in sinker, longer.
ng	“ “ sing, long.
N	“ “ the French bon, Bourbon, and *m* in the French Etampes; where it is equivalent to a nasalizing of the preceding vowel. This effect is approximately produced by attempting to pronounce ‘onion’ without touching the tip of the tongue to the roof of the mouth. The corresponding nasal of Portuguese is also indicated by N, as in the case of São Antão.
sh	“ “ shine, shut.
th	“ “ thrust, thin.
TH	“ “ then, this.
zh	as *z* in azure, and *s* in pleasure.

An apostrophe ['] is sometimes used to denote a glide or neutral connecting vowel, as in tā'b'l (table), kăz''m (chasm).

Otherwise than as noted above, the letters used in the respellings for pronunciation are to receive their ordinary English sounds.

When the pronunciation is sufficiently shown by indicating the accented syllables, this is done without respelling; as in the case of very common English words, and words which are so spelled as to insure their correct pronunciation if they are correctly accented. See the article on PRONUNCIATION.

A PARTIAL LIST OF THE LEADING ARTICLES IN VOLUME VI.

DEBT, PUBLIC.
Dr. Roland P. Falkner and Dr. Alvin Sydney Johnson.

DECAPOLIS.
Professor Edward Everett Nourse.

DECORATIVE ART.
Professor A. D. F. Hamlin.

DEED.
Professor George W. Kirchwey.

DEEP SEA EXPLORATION.
Mr. Charles Haskins Townsend.

DEGENERATION AS A FACTOR IN EVOLUTION.
Professor Alpheus Spring Packard.

DELUGE.
Professor Nathaniel Schmidt.

DEMOSTHENES.
Professor Clifford Herschel Moore.

DENTISTRY.
Dr. Alfred R. Starr.

DESCARTES.
Professor Evander Bradley McGilvary.

DETERMINANTS.
Professor David Eugene Smith.

DEUTERONOMY.
Professor Morris Jastrow.

DEVONIAN SYSTEM.
Professor Heinrich Ries.

DEW.
Professor Cleveland Abbe.

DIALECT.
Professor Daniel K. Dodge.

DICOTYLEDONS.
Professor John Merle Coulter.

DICTIONARY.
Professor James C. Egbert, Jr.

DIES AND DIE-SINKING.
Mr. Moses Nelson Baker.

DIFFRACTION AND DIFFRACTION GRATINGS.
Professor Joseph Sweetman Ames.

DINOSAURIA.
Mr. Gilbert Van Ingen.

DIPHTHERIA.
Dr. Albert Warren Ferris.

DISCIPLES OF CHRIST.
Dr. Frederick D. Power.

DISCIPLINE, ECCLESIASTICAL.
Dr. George James Bayles.

DISCRIMINATION, SENSIBLE.
Professor Edward Bradford Titchener.

DISEASES OF ANIMALS.
Dr. Alfred Charles True.

DISEASES OF PLANTS.
Dr. Alfred Charles True.

DISTILLED LIQUORS.
Mr. Moses Nelson Baker.

DISUSE.
Professor Alpheus Spring Packard.

DIVIDEND.
Professor George W. Kirchwey.

DIVIDING ENGINE.
Professor Joseph Sweetman Ames.

DIVORCE.
Mr. Samuel Warren Dike and Professor George W. Kirchwey.

DOCK.
Mr. Charles Shattuck Hill.

DOG.
Mr. Ernest Ingersoll.

DOMESTIC SERVICE.
Miss Anne O'Hagan.

DONATELLO.
Dr. George Kriehn.

DOORWAY.
Professor Arthur L. Frothingham.

DRAWING.
Professor A. D. F. Hamlin.

DRESS.
Mr. Russell Sturgis.

EARTHQUAKE.
Professor William Herbert Hobbs.

ECLIPSE.
Professor Harold Jacoby.

EDUCATION.
Professor Paul Monroe.

EGYPT.
Mr. Cyrus C. Adams, Professor Christopher Johnston, Professor Edwin A. Start, and others.

EGYPTOLOGY.
Professor Christopher Johnston.

ELECTRICITY.
Professor Joseph Sweetman Ames.

ELECTRIC LIGHTING.
Mr. Moses Nelson Baker.

ELECTRIC RAILWAYS.
Mr. Charles Shattuck Hill.

THE NEW INTERNATIONAL ENCYCLOPÆDIA

DAVIOUD, dȧ'vē'o͞o', Gabriel Jean Antoine (1823-81). A French architect. He was born in Paris, and studied at the School of Fine Arts, where he carried off a number of prizes. He acquired great reputation, as inspector of gardens and public squares, by the important part he took in the embellishment of Paris (1859-62). He ornamented the Bois de Boulogne, the Champs Elysées, and most of the public squares, and was also engaged on various private edifices. His principal work was the Palace of the Trocadéro, erected in conjunction with Bourdais for the world's exposition in 1878.

DA'VIS, Andrew Jackson (1826—). An American lecturer and writer on spiritualism, born in Orange County, N. Y. His first book, *The Principles of Nature*, he dictated in 1845 after a trance of sixteen hours, during which time he claimed to have received his inspiration from communion with inhabitants of the spirit world. Some of his other works are: *The Penetralia* (1856); *The Magic Staff*, an autobiography. (1857); *Arabula, or the Divine Guest* (1867); *Mental Diseases and Disorders of the Brain* (1871); and *Autobiography* (1885). Most of his books are plentifully supplied with allusions to personal experiences with spirit revelation, which must necessarily be received without verification.

DAVIS, Charles Henry (1807-77). An American naval officer, born in Boston. He entered the navy in 1823 as midshipman, and was stationed on different vessels and on the coast survey until 1861, when, with the rank of captain, he was a member of the board which examined the defenses of Southern ports. In the expedition against Port Royal, S. C. (q.v.), he was fleet-captain and chief of staff. He became flag-officer of the Mississippi flotilla early in 1862, and on May 10 engaged a Confederate fleet of eight ironclads (four of them rams) off Fort Pillow (q.v.). Later (June 6) he defeated the fleet decisively in an engagement near Memphis, captured or destroyed all but one of the vessels, and received also the surrender of Memphis. He then joined Farragut in the operations at Vicksburg. Davis attained the rank of rear-admiral in 1863, and spent most of his remaining service as superintendent of the Naval Observatory at Washington, and commander of the Norfolk Navy Yard. He wrote *Geological Action of the Tidal and Other Currents of the Ocean*, and other works of a similar nature, and was superintendent of the *American Nautical Almanac* in 1849-56 and 1859-61.

DAVIS, Charles Howard (1857—). An American painter, born at Cambridge, Mass. He studied with Grondman in Boston, and afterwards under Boulanger and Lefèbvre in Paris, where his "Valley at Evening" attracted considerable attention at the Exposition of 1878. He lived many years in France, and on his return took up his residence at Mystic, Conn. He obtained the Palmer prize for landscape at the Chicago Exposition of 1890, and the $2000 prize given by the American Art Association in 1887. Other notable works by him are: "The Brook," in the Philadelphia Academy; "Late Afternoon," at the Union League Club, in New York City; and "Evening," at the Metropolitan Museum, in New York City. His works are characterized by fidelity to Nature.

DAVIS, Cushman Kellogg (1838-1900). An American statesman. He was born in Henderson, N. Y.; graduated at the University of Michigan in 1857, studied law, and during the Civil War served in the Federal Army. In 1867 he was a member of the Minnesota Legislature, and from 1868 to 1873 was United States district attorney. In 1874 he was elected Governor of his State. In 1887 he was elected to the United States Senate. He succeeded John Sherman as chairman of the Committee on Foreign Relations, and, upon the conclusion of the Spanish-American War, was appointed one of the United States peace commissioners. His influence was important in securing the consent of the Senate to the Treaty of Paris. He published *The Law in Shakespeare* (new ed., 1900).

DAVIS, David (1815-86). An American jurist, born in Cecil County, Md. He graduated at Kenyon College, Ohio, in 1832, and was admitted to the Illinois bar. He was afterwards a member of the State Legislature and of the State Constitutional Convention of 1847, was a judge of the State Circuit Court from 1848 to 1862, and was a justice of the United States Supreme Court from 1862 to 1877. In 1872 he accepted the Presidential nomination from the

National Labor Reform Party, but afterwards withdrew his name. From 1877 to 1883 he was a United States Senator, and succeeded Chester A. Arthur as President of that body, serving until 1883. In politics he was an independent, but usually acted with the Democratic Party.

DAVIS, George Royal (1840-99). An American soldier and politician, born at Palmer, Mass. He served throughout the Civil War, and rose to be colonel of the Third Rhode Island Volunteer Cavalry. From 1879 to 1885 he was a Republican member of Congress from Illinois, and in 1884 and again in 1888 was a delegate to the Republican National Convention. He was director-general of the Columbian Exposition of 1893.

DAVIS, George Whitefield (1839—). An American soldier, born at Thompson, Conn. He enlisted in the Eleventh Connecticut Infantry in 1861, and by 1865 had received the brevet rank of major. He was appointed captain in the Fourteenth United States Infantry in 1867, and retired in 1903 with the rank of major-general. He was appointed military governor of Porto Rico in 1899, inspector-general of the army in the Philippines in 1900, and was military governor of Manila in 1901. He was appointed a member of the Isthmian Canal Commission in 1904, and was governor of the Canal Zone in 1904-5. In 1905, he was appointed on the Board of Consulting Engineers for the canal.

DAVIS, Henry William Banks (1833—). An English painter, born at Finchley. He was a pupil of the Royal Academy, and was elected a member in 1877. Many of his subjects represent the French coast about Boulogne. Among his landscapes are: "Spring Ploughing" (1866); "Dewy Eve" (1870); "After Sundown" (1877), "Showers in June" (1882); "The Road to the Sanctuary;" "Lost Sheep;" "Sea and Land Waves;" and "Contentment." His treatment of landscape is exact and delicate.

DAVIS, Henry Winter (1817-65). An American legislator. He was born in Annapolis, Md., graduated at Kenyon College in 1837, and studied law at the University of Virginia. In 1850 he settled in Baltimore. He was a member of Congress from 1855 to 1861, and again from 1863 to 1865, first as a Whig, then as a Know-Nothing or American, and finally as a Republican, and made himself conspicuous by his devotion to the Union and his advocacy of the emancipation of the slaves. During his latter term (1863-65) he was chairman of the Committee on Foreign Affairs. He published *The War of Ormuzd and Ahriman in the Nineteenth Century* (1853). His speeches, edited by Cresswell, were published in New York in 1867.

DAVIS, James. See Hall, Owen.

DAVIS, Jefferson (1808-89). A soldier, statesman, and the President of the Confederate States of America. He was born in Christian, now Todd, County, Ky., June 3, 1808, the chief strains in his blood being Welsh and Scotch-Irish. His family removed during his infancy to Mississippi, with which State his fame has always been connected. He received a gentle rearing, although his education was at first limited, owing to the conditions of the country. After a year or two at a Roman Catholic school in Kentucky, and a short period at a college in Mississippi, he entered Transylvania University at Lexington, Ky., an institution which seems to have done good work for those times. Here he received the elements of a classical education; but in 1824, before graduation, he was transferred to West Point. He graduated rather low in his class, but he had given evidence of soldierly qualities and had won the regard of his classmates. Entering the army at once, in 1828, with the usual brevet of second lieutenant, he served seven years on the northwestern frontier, manifesting capacity to command, to perform arduous duties, and to win confidence and affection. In 1835, falling ill, he resigned from the army, in which he had risen to the rank of first lieutenant, and in the same year married a daughter of Zachary Taylor. The young wife died, however, in a few months, and Davis sought restoration for his shattered health in Cuba. After a short stay in Washington, where he began his friendship with Franklin Pierce, he returned to Mississippi and devoted himself to planting and study. This period from 1837 to 1845 was spent in an almost hermit-like seclusion, and Davis, who, as early as 1833, when the Nullification controversy was at its height, had made up his mind that it was unconstitutional to coerce a State, now gained fluency and logical consistency in advocating the States' rights doctrines held by Calhoun. After some little participation in local politics, he was elected to Congress in 1845, where he favored the annexation of Texas. He was a ready and dignified speaker, and an ardent but by no means servile follower of Calhoun. The next year, on the outbreak of the Mexican War, he was elected colonel of the First Mississippi Volunteers and distinguished himself at Monterey and Buena Vista, his famous formation of the reëntering angle at the latter engagement being a gallant exploit. On his retirement from the war with a severe wound, the Governor of Mississippi in 1847 appointed him to fill a vacancy in the United States Senate, and in 1848 the Legislature elected him for the residue of the term; in 1850 he was reëlected. In the debates relative to the introduction of slavery into the Territories, Davis was zealous for the institution and for a strict construction of the Constitution. In 1851 he resigned in order to make the contest for the Governorship against the Unionist candidate. Davis made a vigorous canvass, but was defeated by a small majority. In March, 1853, he became Secretary of War under President Pierce, and made an efficient official, improving the service in various ways. In the matter of the Kansas-Nebraska legislation he proved a bad adviser to the President, but he was thoroughly conscientious. When he reëntered the Senate in 1857, he was the acknowledged leader of the Southerners, becoming the most determined, though not the most radical, of the States' rights men in the stormy days just before the war. In 1860 Davis offered in the Senate a series of resolutions which were adopted, to the effect that the States had formally accepted the Constitution as independent sovereigns, delegating to the General Government a portion of their power for the sake of security; that the intermeddling on the part of any one of them with the domestic institutions of another was not only insulting, but dangerous to the domestic peace and tending to destroy the Union; that negro slavery was legal, and that neither Congress nor Territorial legislation had the right to interfere with it. Yet Davis was devoted to the Union, and when on the secession of Mississippi in 1861 he left the Senate, it was with real sadness that he set forth his principles in a farewell speech to which a crowded audience listened with deep attention.

On February 9, 1861, Mr. Davis was elected President of the Provisional Government of the Confederacy by the Congress assembled at Montgomery, Ala. He was chosen because his course throughout had been marked by consistency and moderation in comparison with the other secession leaders. The choice was made without intriguing, and was eminently popular. The inauguration took place February 18, 1861. At the expiration of the first year of the Provisional Government a new Congress was elected, and on February 22, 1862, Davis was again inaugurated, entering upon a term which was set for six years by the Constitution. His career as President takes in nearly all of Confederate history, his side of the matter being given ably and fully in his *Rise and Fall of the Confederate Government* (2 vols., 1881). The military training which he had had made him desire a close control over his generals, and he seems in consequence to have made not a few mistakes. The unanimity with which he and General Lee worked would have been impossible had not the latter been so void of selfish ambition. Davis's statesmanship was rather doctrinaire, and when he had actually to assume almost a dictatorship as the war progressed, he was not found well fitted for the eminently executive task of financing and controlling the Confederacy. He strove earnestly to inspirit his people; he set his face against barbarity in the conduct of the war; he tried to alleviate the sufferings of prisoners; and, on the whole, he maintained his dignity and self-respect under ordeals that would have crushed a man less resolute or less sincere.

After the surrender of Lee and of Johnston, Davis, with a few friends who volunteered as an escort, started for Washington, Ga., for the purpose of making his way to the trans-Mississippi region. A report that his wife was in danger led him to change his course to join her, and on May 10, 1865, he was captured at Irwinville, Ga. The story of his assuming woman's dress as a disguise has been shown to be untrue. He was confined in Fortress Monroe and subjected to the useless degradation of manacles. He earnestly desired a public trial, and feared that he would die before refuting the charge of complicity in the assassination of Lincoln. An indictment was found against him for treason, but he was admitted to bail, Horace Greeley, Gerrit Smith, and other prominent Northerners going on his bond, and later the proceedings were quashed. After his release he visited Canada and England, and went into business at Memphis, Tenn. In 1879 he finally retired to Beauvoir, near Biloxi in Mississippi, resisting all efforts to induce him to try to reënter politics, and devoting his time to writing and study. He retained the confidence of most of the Southern people, and his conduct during his retirement was dignified and consistent. He died of a congestive chill on December 6, 1889, and was buried with imposing ceremonies at New Orleans. In 1893 the body was removed to Richmond. A full and valuable biography of Mr. Davis was written by his second wife, a Miss Howell, whom he married in 1845. She died in 1906. See also a brief autobiographical article published in *Bedford's Magazine* for January, 1890, and W. P. Trent's *Southern Statesmen of the Old Régime* (1897). The earlier biographies by Alfriend and Pollard are respectively eulogistic and condemnatory. For full accounts of Davis's period consult Rhodes, *History of the United States from the Compromise of 1850* (New York, 1892 et seq.), and Dodd, *Jefferson Davis* (Philadelphia, 1905).

DAVIS, JEFFERSON C. (1828-79). An American soldier, born in Indiana. He served as a volunteer in the Mexican War, subsequently becoming lieutenant in the regular army, and was stationed at Fort Sumter during the bombardment of April 12-13, 1861. During the Civil War he served as brigadier-general, and played an important part in the battle of Pea Ridge, the siege of Corinth, the battle of Stone River, and Sherman's Atlanta campaign. He was brevetted major-general United States Army in 1865, and became a colonel in the regular service in the following year. In 1873, after the murder of General Canby, he suppressed the Modoc uprising in northern California.

DAVIS, or **DAVYS,** JOHN (c. 1550-1605). An English navigator, born at Sandridge, near Dartmouth. He is principally distinguished for having, between 1585 and 1588, undertaken three voyages to the northern seas in search of a northwest passage. In the first of these he discovered the strait which bears his name; in the last, he sailed up this strait as far as 72° 12′ N. His voyages extended along the West Greenland coast as far as what is now Upernavik, and along the coast of the American side of the strait from Cape Dyer to southern Labrador. He afterwards made five voyages to the East Indies, in the last of which he was killed in a fight with Japanese pirates on the coast of Malacca. He wrote *The World's Hydrographical Description* (1595) and *The Seaman's Secrets* (1594), which were republished by the Hakluyt Society in 1880. He is often confounded with John Davis of Limehouse, another navigator and author.

DAVIS, JOHN CHANDLER BANCROFT (1822—). An American diplomatist. He was born in Worcester, Mass., graduated at Harvard in 1840, studied law, and practiced in New York. He was secretary of the United States Legation in London from 1849 to 1852, was the American correspondent of the London *Times* from 1854 to 1861, and from 1869 to 1871 was Assistant Secretary of State, which position he resigned to act as United States agent at the Geneva Court of Arbitration (see ALABAMA CLAIMS), after having served as secretary of the commission which concluded the Treaty of Washington. From 1874 to 1877 he was United States Minister to Germany, and from 1878 to 1881 was a judge in the United States Court of Claims at Washington. He became reporter of the United States Supreme Court in 1883. Among his publications, in addition to the reports of Supreme Court decisions, are: *The Massachusetts Justice* (1847); *The Case of the United States Laid Before the Tribunal of Arbitration at Geneva* (1871); and *Treaties of the United States, with Notes* (new ed. 1873).

DAVIS, JOHN D. (1854—). An American Orientalist and biblical scholar. He was born at Pittsburg, Pa., and was educated at the College of New Jersey and at the Universities of Bonn and Leipzig, afterwards becoming professor of Oriental and Old Testament literature at Princeton Theological Seminary. In addition to frequent contributions to theological magazines, he has published *A Dictionary of the Bible* (1898), and a work entitled *Genesis and Semitic Tradition* (1894).

DAVIS, Sir John Francis (1795-1890). An English diplomat and Sinologist, born in London. He was a son of Samuel Davis, director of the East India Company, from 1810 to 1819. He accompanied Lord Amherst to Pekin in 1816, and rose rapidly in the service of the East India Company, in the employ of which he had been since his boyhood. After serving for two years as the chief representative of the company at Canton, he was appointed joint commissioner in China with Lord Napier in 1834, and in 1844 became British plenipotentiary in China. In his capacity as governor of the British colony at Hong Kong, he contributed greatly to the development of British trade at that centre. It was under his administration that the Bogue forts were reduced, and the annoyances to which British residents had been subjected at the hands of the mandarins were ended. Although he may in some respects be said to have laid the basis of British power at Hong Kong, the treaty whereby the city was to be opened to foreigners, which Davis had arranged with the Chinese Government, was disapproved by England, and, mortified at this lack of recognition, he resigned his position in 1848. Of his works relating to China and Chinese life, the following are especially noteworthy: *Chinese Novels Translated from the Originals* (1822); *Hien Wun Shoo, Chinese Moral Maxims, with a Free and Verbal Translation* (1823); *The Fortunate Union* (translated from the Chinese, 1829); *The Chinese, A General Description of China and Its Inhabitants* (2 vols., 1836); and *Chinese Miscellanies* (1865).

DAVIS, Matthew L. (1766-1850). An American author, born in New York. He was long the Washington correspondent of the *New York Courier and Enquirer*, over the pen-name "The Spy in Washington." In 1797 he conducted a short-lived literary enterprise at New York, known as the *Timepiece and Literary Companion*. As the friend of Aaron Burr during a period of forty years, he published the *Memoirs and Miscellaneous Correspondence* of that statesman (2 vols., 1836); and also edited *The Private Journal of Aaron Burr During His Residence in Europe* (1838).

DAVIS, Nathan (1812-82). An English traveler and archæologist. He edited the *Hebrew Christian Magazine* in 1852, subsequently was a Nonconformist clergyman, and in 1856-58 conducted at Utica and Carthage excavations for the British Museum. He published *Tunis* (1841); *Arabic Reading Lessons* (with B. Davidson, 1854); *Evenings in My Tent* (2 vols., 1854); *Carthage and Her Remains* (1861); *Ruined Cities Within Numidian and Carthaginian Territories* (1862); and other works.

DAVIS, Nathan Smith (1817-1904). An American physician. He was born at Greene, N. Y., and was educated in Cazenovia Seminary and in the College of Physicians and Surgeons of the western district of New York, whence he graduated in 1837. He was the projector and founder in 1845 of the American Medical Association, of which he has filled every office. He practiced at Binghamton, N. Y., 1837-47; New York City, 1847-49, during which time he was editor of the *Annalist;* professor of physiology and pathology, Rush Medical College, Chicago, 1849-59, and professor of practice of medicine, 1850-59. He organized the *Northwestern Medical Journal* in 1855, and was its editor till 1875; organized the *Medical Examiner* in 1860, and edited it till 1873. He was professor of principles and practice of medicine, Chicago Medical College, from 1859 to 1886, when he became emeritus professor. He organized the *Journal of the American Medical Association* in 1883, and edited it till 1889. He was a founder of the Northwestern University, of the Chicago Academy of Sciences, the Chicago Historical Society, the Illinois State Microscopical Society, the Union College of Law (in which he was for many years professor of medical jurisprudence), and the Washington Home for Inebriates. He published, among other books, *A Text-book on Agricultural Chemistry* (1848); *History of Medical Education and Institutions in the United States* (1851); *Effects of Alcoholic Drinks* (1854); *History of the American Medical Association* (1897); *Clinical Lectures* (1884); and *Progress of Medical Education in the United States* (1876).

DAVIS, Noah (1818-1902). An American jurist. He was born in Haverhill, N. H., removed to Albion, N. Y., with his parents in 1825, was admitted to the New York bar in 1841, and practiced in Buffalo and other western cities in that State. He served for three terms as a justice of the New York Supreme Court, was a member of Congress in 1869-70, and in 1872 again became a justice of the State Supreme Court. The famous trials of Edward Stokes and W. M. Tweed were held before him, and he sentenced Tweed to twelve years' imprisonment—a cumulative sentence, which was later disallowed by the Court of Appeals. He was Chief Justice from 1874 until 1887, when he resigned.

DAVIS, Rebecca Harding (1831—). An American novelist and miscellaneous writer, born at Washington, Pa. She was married to L. Clarke Davis, a Philadelphia journalist, in 1863. Of her numerous novels, the more noteworthy are *Dallas Galbraith* (1868) and *A Law Unto Herself* (1878). Among many short stories, her first *Life in the Iron Mills* (1861), once attracted much attention as a realistic picture of artisan life. She wrote *Bits of Gossip* (1904).

DAVIS, Richard Harding (1864—). An American journalist and novelist. He was born in Philadelphia, Pa., a son of Rebecca Harding Davis, and was educated at the Lehigh and Johns Hopkins universities. He began his writing as a reporter in Philadelphia. In 1888 he came to New York and gained distinction for noteworthy stories, first printed in the New York *Evening Sun*. For a short time he was managing editor of *Harper's Weekly* (1890). His first publications were: *Gallegher and Other Stories* (1891); *Stories for Boys* (1891); and *Van Bibber and Others* (1892). These were followed by *Our English Cousins* (1894); *About Paris* (1895); *The Rulers of the Mediterranean* (1894); *The Exiles* (1895); *Three Gringos in Venezuela and Cen-*

tral America (1896); *Cuba in War Time* (1898); *The Cuban and Porto Rican Campaign* (1898); and *With Both Armies in South Africa* (1900). His novels are: *The Princess Aline* (1896); *The King's Jackal* (1899); *Soldiers of Fortune* (1897), dramatized and presented with great favor in 1902; *Captain Macklin: His Memoirs* (1902); *Ransom's Folly*, a collection of stories (1902); *The Bar Sinister* (1904), and *Kits and Outfits* (1905). His later plays include: *The Taming of Helen* (1903); *Ransom's Folly* (1904); *The Dictator* (1904); *Miss Civilization*, a one-act piece produced by amateurs in New York (1905); *Galloper* (1905).

DAVIS, THOMAS OSBORNE (1814-45). An Irish poet. He was born at Mallow, and was educated at Trinity College, Dublin. In 1841 he became associate editor of the Dublin *Morning Register*, and in the following year, in collaboration with Duffy and Dillon, he founded the *Nation* newspaper, an organ of Nationalist tendencies, which acquired an immense popularity—due largely to the patriotic poems occasionally contributed to it by Davis. Notwithstanding his Protestant faith and early Tory affiliations, Davis earnestly endeavored to allay the discords between the Catholic and Protestant elements. He was gifted with a remarkable capacity for work, and was universally respected for his sterling integrity and the fidelity with which he adhered to his convictions. One of his noteworthy achievements was his founding of the party known as 'Young Ireland.' His *Poems*, which include the fine verses entitled "Máire Bhán a Stoír," "The Sack of Baltimore," and "The Flower of Finae," were collected and published after his death. Consult Duffy, *New Irish Library* (London, 1893 et seq.).

DAVIS, VARINA ANNE JEFFERSON, known as 'The Daughter of the Confederacy' (1864-98). An American author. She was the daughter of President Jefferson Davis of the Confederate States of America, and was born in Richmond, Va. She was educated abroad, and was known as a musician, painter, and writer. Her works include a *Sketch of the Life of Robert Emmet* (1888); *The Veiled Doctor* (1895); and *A Romance of Summer Seas* (1898).

DAVIS, WILLIAM MORRIS (1850—). An American geographer and meteorologist. He was born in Philadelphia, and was educated at the Lawrence Scientific School and at Harvard University. In 1866 he made an observation of a new star, *T. Coronæ Borealis*, of which at the time only one other astronomical observation was made in the United States. He also rendered valuable service as assistant astronomer in the Argentine National Observatory at Córdoba from 1870 to 1873. He taught astronomy and geology at Harvard for fourteen years, and in 1890 became professor of physical geography there. His works include: *Elementary Meteorology* (1894); *Physical Geography* (1899); *Whirlwinds, Cyclones, and Tornadoes* (1884); and "Journey Across Turkestan," in Pampelly's *Explorations in Turkestan* (1905).

DAVIS STRAIT. The sheet of water separating Greenland on the east from Baffin Land on the west, and connecting Baffin's Bay with the Atlantic (Map: North America, N 3). It is from 180 to 500 miles wide, and was discovered in 1585 by John Davis, whence its name. It has soundings exceeding 5000 feet in the northern and southern portions, but not reaching 2500 feet in the intervening region. It has two powerful currents—one (of drift ice) on the west, toward the south, and one on the east, toward the north.

DAV'IT (formerly *davitt*, *david*, from *David*, the custom of giving implements proper names being a frequent one). A derrick of various forms, depending upon the use to which it is put. *Boat-davits* are used in hoisting boats, the *cat-davit* in catting the anchor, and the *fish-davit* in fishing it. In modern ships fish-davits are seldom used. The *cat-davit* is usually placed amidships between the bower anchors, and is long enough to reach both. It consists of a heavy pivoted base against which the heel of the iron spar or derrick rests, held in place by a large bolt. On the other side of the base there is a heavy projecting lug. To this is secured the backbone of the derrick, which consists of two iron bars extending up to the head. By taking down these bars the davit may be laid nearly flat on deck, so as to be out of the way of gunfire.

DA'VITT, MICHAEL (1846-1906). An Irish journalist and political leader, the founder of the Irish Land League. He was born in Straid, Mayo, where his parents, poor peasants, were evicted from their farm when Davitt was four years of age. While engaged as a boy in a cotton factory at Haslingden, Lancashire, he lost his right arm in the machinery. From the age of fifteen to twenty-two he worked in a printing-office, and educated himself. He joined the Irish revolutionary movement in 1867, and was present at the attack on Chester Castle. Detected transporting arms into Ireland in 1870 he was sentenced to fifteen years' penal servitude; but after serving half the sentence was released on a ticket of leave in 1877, and visited the United States on a lecturing tour. He obtained the funds to carry on a crusade against Irish landlordism, and on October 21, 1879, at his birthplace, organized the Land League movement, which spread over Ireland. He again visited this country in 1880, to superintend the organization of an American branch of the Land League, but hurried back to England on account of the prosecution of the Land League executive. He was arrested under the Coercion Act and reimprisoned to finish his old sentence. He was leniently treated during fifteen months, and again released on a ticket of leave. He revisited America to advocate the revival of the Land League, and on his return to Ireland organized the National League. In 1883 he was imprisoned for three months for a seditious speech. In 1882, while in prison, he had been elected member of Parliament for Meath, but was disqualified on the grounds of his unexpired ticket of leave. Elected in 1892 to the House of Commons for Westmeath and unseated, he was returned unopposed for North East Cork, but shortly afterwards was compelled to vacate through bankruptcy. In 1895 he was returned unopposed for East Kerry and South Mayo, but resigned in 1899. In 1889 he was implicated in the "Parnellism and Crime" prosecution instigated by the London *Times*, and conducted his own defense in an effective speech which received the commendation of the presiding judge. Although a strong Home Ruler, he was opposed to Parnell's land nationalization scheme, and at that leader's deposition in 1890 Davitt became a prominent Anti-Parnellite. After a visit to Australia, he published his *Impressions of Australasian Democracy,* in 1898, and the same year wrote letters to *The Times* contending that the dominating English-speaking race in America is largely of Celtic origin, and therefore anti-Saxon in feeling. He visited South Africa during the Boer war and investigated the massacre of Kishineff in 1903. Besides a vast number of journalistic articles, including "Prisons Revisited" in the *Daily Chronicle* (1889), his works include *Leaves from a Prison Diary* (1884); *Defence of the Land League* (1891); *The Boer Fight for Freedom* (1902); *Within the Pale* (1903); *The Fall of Feudalism in Ireland* (1904); *Pageant of London* (1905). Consult Cashman, *Life of Michael Davitt* (Boston, 1881).

DAVOS, dä′vôs. A Rhætian-Alpine valley in the Canton of Grisons, Switzerland, 5115 feet above sea-level. Stretching about 20 miles from east to southwest, between wooded mountains, it is traversed by the Davos Landwasser, which flows from Lake Davos; the lake has an area of one-fifth of a square mile, and a depth of 175 feet. The sheltered situation and pure, dry air of the valley have made it a favorite winter and summer resort for invalids, especially consumptives. Davos Platz and Davos Dorf, its former villages, are now thriving and fully equipped health resorts with hotels, sanatoriums, etc. Davos Platz (population, in 1900, 8334) is the chief town of the district, and in the fifteenth century was the capital of a confederation of ten Grison republics. Consult Symonds, *Our Life in the Swiss Highlands* (London, 1892).

DAVOUT, dȧ′vo͞o′, Louis Nicolas, Duke of Auerstädt and Prince of Eckmühl (1770-1823). One of Napoleon's most celebrated marshals. He was born May 10, 1770, at Annoux, in Burgundy, of a noble provincial family. After being educated at Brienne he entered the army as lieutenant of cavalry in 1788, but his revolutionary leanings led to his dismissal in 1790. He soon reappeared, however, in the Army of National Defense, and during the Revolutionary wars served with distinction under Dumouriez, Pichegru, and Moreau. In 1798 he rose to be general, and accompanied his chief, Desaix, to Egypt. There he soon attracted the attention of Bonaparte by the skillful way in which he handled his troops at Abukir. On returning to France in 1800, Davout was made a general of division and commanded the cavalry in the Italian campaign of that year. Shortly afterwards he became inspector-general of cavalry and commander of the Consular Guard. Soon after the Empire was proclaimed he became a marshal of France (1804), a member of the Legion of Honor (1805), and commander of the Third Army Corps. In all of Napoleon's campaigns Marshal Davout distinguished himself. At Auerstädt (1806) his generalship won the day against superior forces. After the Peace of Tilsit Davout was left as Governor of the Grand Duchy of Warsaw. His harsh administration provoked numerous complaints on the part of the inhabitants; but he appears to have merely carried out the instructions of Napoleon, who, in 1808, created him Duke of Auerstädt. The brilliant victory won at Eckmühl in 1809 earned for him the further title of Prince. At Wagram (q.v.) he practically won the battle by turning the enemy's left. He took a prominent part in the Russian campaign of 1812, gaining a victory at Mohilev and being wounded at Borodino. After the retreat he was made commandant of the Thirty-second Military District, with headquarters at Hamburg; but after defending the city for several months against 80,000 Germans, he surrendered and made his submission to Louis XVIII. His loyalty, however, was not proof against the return of Napoleon, and during the Hundred Days he acted as Minister of War and showed remarkable genius in organizing troops and procuring supplies. After Waterloo he was forced to surrender the command he had assumed under the walls of Paris, and for a time was in deep disgrace and deprived of his titles and estates. Nevertheless he protested vigorously against the proscription of 1815, and made praiseworthy efforts to save Ney's life. In 1817 his rank was restored to him, and in 1819 he took a seat in the House of Peers, where he frequently protested his loyalty to the Bourbon line. He died in Paris, June 1, 1823. Consult: Blocqueville, *Le maréchal Davout* (Paris, 1879-80); *Correspondance du maréchal Davout,* ed. Mazade (4 vols., Paris, 1885); Jomini, *Life of Napoleon,* trans. by Halleck (5 vols., New York, 1864).

DA′VUS (Lat., a Dacian). The name of the conventional slave in Latin comedy.

DA′VY, Sir Humphry (1778-1829). A celebrated English natural philosopher. He was born December 17, 1778, at Penzance, in Cornwall, where his father was a carver in wood. At the school of Truro, where he was educated until he was fifteen, he showed little relish for classical learning, but was distinguished for a highly retentive memory and an early passion for poetry, which never forsook him. In 1795 he became apprenticed to a surgeon and apothecary at Penzance. At the same time he entered upon a course of study all but universal: "speculations on religion and politics, on metaphysics and morals, are placed in his note-books in juxtaposition with stanzas of poetry and fragments of romance." A system of mathematical study, skeptical philosophy, Scotch metaphysics, and German transcendentalism successively engaged his attention. The study of natural philosophy brought him nearer to that department which was to be his own; but it was not till he had reached his nineteenth year that he entered seriously upon the study of chemistry. He now made the acquaintance of Dr. Beddoes, who had established a pneumatic institution at Bristol, and who took him as his assistant. Here Davy carried out a course of experiments on the curative effects of different gases, in which he had more than once nearly sacrificed his life. He thus discovered the singular exhilarating effect of nitrous oxide (laughing-gas). The account which he published of his researches established his reputation, and led to his appointment, at the age of twenty-two, as lecturer at the Royal Institution of London. He delivered his first lecture in 1801, and his eloquence, and the novelty and variety of experiments, soon attracted large and brilliant audiences. In 1802 he was made professor of chemistry at the Royal Institution. In 1803 he began researches connected with agriculture, and during ten years lectured before the Board of Agriculture on agricultural chemistry. His lectures were published in 1813, under the title of *Elements of Agricultural Chemistry.* The discoveries, however, on which Davy's fame as a chemist chiefly rests, took their origin in the views which he developed in 1806 in the Bakerian lecture, *On Some Chemical Agencies of Electricity.* This essay was universally regarded as one of the most valuable contributions ever made to chemical science, and obtained the prize of the French Institute. According to Davy, chemical affinity is nothing but the mutual electrical attraction of the ultimate particles of matter, and chemical combination is caused by the equalization of electric potentials. Davy's electrolytic experiments led to the establishment on a firm scientific basis of Lavoisier's idea that bases are compounds of oxygen with metals, and to the extension of this idea to caustic potash and soda, which Lavoisier had regarded as elements. In 1807 Davy succeeded in decomposing potash. When he first saw the globules of the new metal potassium, his delight is said to have been so ecstatic that it required some time for him to compose himself before he was able to continue the experiments. He next decomposed soda, strontia, and magnesia, and would have decomposed lime and baryta if he had not been prevented from doing so by a severe illness, during which those alkaline earths were decomposed by Berzelius and Pontin. In 1809 he demonstrated the elementary nature of chlorine, and proved that hydrochloric acid is a compound of chlorine and hydrogen. It thus became clear that oxygen was not by any means an essential constituent of acids.

In 1812 Davy was knighted, married a lady of considerable wealth, and resigned the chemical chair of the Royal Institution. That he might investigate his new theory of volcanic action, he received permission from the French Government—though the two countries were then at war—to visit the Continent, and was received with the greatest distinction by the scientific men of France. On returning to England, in 1815, he entered on the investigation of the nature of fire-damp, which is the cause ot explosions in coal-mines. This resulted in the invention of the safety lamp (q.v.)—one of the most valuable presents ever made by science to humanity. Though the value of the invention was everywhere acknowledged, the only national reward was a baronetcy after a lapse of three years. On the death of Sir Joseph Banks, in 1820, Sir Humphry Davy was elected president of the Royal Society. His attention was shortly after called to the important object of preserving the copper sheathing of vessels from corrosion by the action of sea-water. This he effected by means of bands of zinc; but the bottoms of the vessels became so foul from the adhesion of weeds, shells, etc., that the plan had to be abandoned.

Early in 1825 Sir Humphry Davy had begun to complain of the loss of strength, and in 1826 he had a paralytic attack affecting his right side. He made two journeys to the Continent for the recovery of his health, and died at Geneva on May 29, 1829, at the early age of fifty-one. The Genevese Government evinced their respect by a public funeral. So widely spread was the reputation of Sir Humphry Davy that he was a member of almost all the scientific institutions in the world. Cuvier, in his *Eloge*, says: "Mr. Davy, not yet fifty-two years of age, occupied, in the opinion of all that could judge of such labors, the first rank among the chemists of this or of any other age." Besides works already mentioned, and a great number of contributions to the *Philosophical Transactions*, Sir Humphry Davy published: *Elements of Chemical Philosophy* (London, 1812), and *Salmonia, or Days of Fly-Fishing*, published in 1827. His *Consolations in Travel, or the Last Days of a Philosopher* (3d ed., London, 1831), appeared after his death. Consult: *Memoirs of the Life of Sir Humphry Davy*, by his brother (2 vols., London, 1836), and *The Life of Sir Humphry Davy*, by Dr. Paris (London, 1831). See, also, CHEMISTRY; and CHEMISTRY, AGRICULTURAL.

DAVY JONES'S LOCKER. A common phrase applied to the ocean as the grave of men drowned at sea. Davy Jones is a sailor's familiar name for a malignant sea-spirit, or for the devil.

DAVY SAFETY LAMP. See SAFETY LAMP.

DAW. See JACKDAW.

DAW, SIR JOHN. A cowardly gull and butt in Jonson's *Epicœne.* The wits, in the play, arrange a duel between him and Sir Amorous La-Foole, from which both are glad to escape with a score of kicks from their mockers.

DAWAL'LA. A catfish (*Ageneiosus dawalla*) found in the rivers of Guiana, and highly esteemed as food. It is sometimes two and one-half feet long, and has a snout somewhat like that of a pike, but the mouth is furnished only with very minute teeth. The skin is destitute of scales, and the colors have that brightness so often seen in tropical fishes—green, brown, and carmine.

DAWANT, dȧ'väN', ALBERT PIERRE (1852—). A French painter, born in Paris. He was a pupil of Laurens, and both in color and composition resembles his master. His pictures include "A Choir of Boys" (1888), in the Luxembourg; "The End of the Mass" (1890); and "The Captive" (1896). One of his best historical pictures is "The Emperor Henry IV. of Germany Before Pope Gregory VII." (1880). He received a first-class medal at the Paris Exposition in 1889, and was made Officer of the Legion of Honor in 1900. His recent works include "Distress" and "Death," exhibited at St. Louis in 1904.

DAWES, dạz, CHARLES GATES (1865—). An American civil engineer, lawyer, and politician, born at Marietta, Ohio. He graduated in 1884 at Marietta College, and in 1886 at the Cincinnati Law School, became chief engineer of an Ohio railway, and practiced law at Lincoln, Neb., in 1887-94. He was a leader in the McKinley movement in Illinois which resulted in instructions for McKinley at the Springfield (Ill.) Convention of April, 1896. He was Comptroller of the Currency from 1897 to 1901. He published *The Banking System of the United States* (1894).

DAWES, HENRY LAURENS (1816-1903). An American politician, born in Cummington, Mass. He graduated at Yale in 1839, engaged in newspaper work for a time, studied law, and in 1842 was admitted to the bar. He was a member of the Massachusetts Legislature from 1848 to 1852, and was United States district attorney for the western district from 1853 to 1857. He then served in Congress from 1857 to 1873, and in the Senate from 1875 to 1893. During this time he was active on several committees, particularly on that of Indian Affairs.

DAWES, Richard (1708-66). An English Greek scholar, educated at Cambridge. In 1738 he was made master of Saint Mary's Hospital at Newcastle, where he continued for ten years. His mastership was not successful. In 1749 he resigned and retired to Heworth, where he died. His last years were clouded by incipient insanity. Dawes is best known for his *Miscellanea Critica*, first published at Cambridge (1745). The best edition is by Kidd (Cambridge, 1817, 1827). This is a work of genuine worth, but contains some unfortunate attacks on Bentley. It embraces emendations on Terentianus Maurus, Aristophanes, and the Greek tragedians; discussions of the correct pronunciation of Greek, the use of the subjunctive and optative moods, the digamma, ictus, etc. Consult: Luard, in *Dictionary of National Biography*, vol. xiv. (London, 1888); Monk, *Life of Bentley*, vol. ii. (London, 1830); and Hodgson, *Archæologia Æliana*, vol. ii. (Newcastle, 1832).

DAWISON, dä'vê-sôn, Bogumil (1818-72). A Polish-German actor, born at Warsaw, of Jewish parents. He began his career on the Polish stage in his native city and afterwards played at Lemberg. Inspired there by the acting of two distinguished members of the Vienna Court Theatre, he resolved to identify himself henceforth with the German stage, applied himself assiduously to the study of the German language, and soon appeared with success in principal parts of standard dramas. In 1847 he played for the first time in Germany at Hamburg, was invited to Vienna in 1849, and there won great applause, especially in Shakespearean parts. In 1852 he became connected with the Court Theatre at Dresden, where he remained until 1864, interrupting his engagement only by traveling tours to the principal cities of Germany. Through his great talent and by his own exertions he had attained such eminence on the German stage as to be deemed by many the greatest actor of his time. In 1866 he came to America, where he appeared with great success during two years. Soon after his return to Dresden in 1869 he became insane, and never recovered.

DAW'KINS, John. See Artful Dodger, The.

DAWKINS, William Boyd (1838—). An English geologist and paleontologist, appointed professor at Owens College in 1874. He was born at Welshpool, Montgomeryshire, Wales, and after graduating at Jesus College, Oxford (1860), became assistant geologist (1862), and later geologist (1867), to the Geological Survey of Great Britain. He was a member of the Channel Tunnel Committee (1882), and, after making a geological survey of the French and English coasts, laid down the line for a tunnel under the Humber (1883-84). His principal scientific work relates to the investigations of cave faunas. In addition to his papers on fossil mammalia contributed to the *Proceedings* of the Geological, Anthropological, and Royal societies, he published: *Cave-Hunting* (1874); *Researches on the Evidences of Caves Respecting the Early Inhabitants of Europe* (1874); *Early Man in Britain* (1880); *British Pleistocene Mammalia* (1866-87). He was made examiner at the University of London in 1885.

DAW'LISH. An attractive and popular seaside resort in Devonshire, England (Map: England, C 6). It is situated in a sheltered valley opening on the English Channel, 12 miles southwest of Exeter. Population, in 1891, 4200; in 1901, 4000.

DAW'SON. A city and county-seat of Terrell County, Ga., 98 miles southwest of Macoy, on the Central of Georgia and the Sea Board Air Line railroads (Map: Georgia, B 4). It is in a cotton and fruit growing district and has cotton-oil, lumber, and grist mills. Settled about 1855, it was incorporated the following year. Under a revised charter of 1891 the city is governed by a mayor, elected for a term of two years, and a board of aldermen. Pop., 1900, 2926.

DAWSON. A river port, the capital of Yukon Territory, in the northwestern part of Canada. It is situated on the right bank of the Yukon River, at its confluence with the Klondike, in about latitude 64° 5′ N., longitude 139° 30′ W., 360 miles direct north-northwest of Skagway, and about 1500 miles above the mouth of the Yukon River. It lies at an elevation of about 1400 feet above the sea, and near the site of old Fort Reliance (Map: Canada, C 4). It is the distributing and receiving centre of the Klondike gold-mining region, and has a United States consulate, banks, and several large trading warehouses. The town dates from shortly after the discovery of gold on Bonanza Creek, August 16, 1896. It is now a busy and well-established business centre. Since 1904 its government has been administered by the Territory. It is connected by a fleet of river steamers with the posts and stations on both the lower and upper Yukon, and with telegraph lines to the coast. Population, 1901, 9142; 1906 (est.) 3000.

DAWSON, Alec John (1872—). An English novelist. He was born at Wandsworth, near London. After three years at sea he ran away while in Australia, and began a life of adventure, traveling in the South Sea Islands, New Zealand, India, Mauritius, South America, West Africa, Morocco, Portugal, California, and all parts of Europe. He won attention with a collection of West Africa stories entitled *In the Bight of Benin* (1897), which was followed by *African Nights' Entertainments*, a series of fiery stories of love and adventure in Northern Africa. Among his other novels are: *Mere Sentiment* (1897); *Middle Greyness* (1897); *Bismillah, a Romance* (1898); *God's Foundling* (1898); *Story of Ronald Kestrel* (1900); *The Half Caste* (1901); *Evolution and Its Bearing on Religions* (1901); *Hidden Manna* (1902).

DAWSON, George Mercer (1849-1901). A Canadian geologist, son of Sir John William Dawson. He was born in Truro, Nova Scotia, and educated at McGill University and at the Royal School of Mines in London. In 1873 he received the appointment of geologist and botanist to the North American Boundary Commission, and subsequently he was on the staff of the Geological Survey of Canada. He was a member of the Bering Sea Commission in 1891. From 1895 until his death he filled the office of director of the Geological Survey of Canada, in which connection he rendered important services to his country. His numerous scientific papers were published mostly in the reports of the survey. He was the author of *Descriptive Sketch of the Physical Geography and Geology of Canada* (1884), and of *The Physical and Geological Features of Part of the Rocky Mountains* (1885).

DAWSON, JEMMY. A youthful follower of the Young Pretender, hanged, drawn, and quartered before the eyes of his sweetheart.

DAWSON, Sir JOHN WILLIAM (1820-99). A Canadian geologist and educator, born in Pictou, Nova Scotia. He entered the University of Edinburgh, where for some time he pursued the study of science, and, upon returning to Nova Scotia, began active work in geology. In 1841 he assisted Sir Charles Lyell in exploring the geological formations of Nova Scotia, as a result of which he collected much new and valuable material in paleontology. The results of his early investigations were published in *Acadian Geology* (3d ed. 1880), and in American and foreign periodicals. In 1850 he became Superintendent of Education in Nova Scotia, and in 1855 he was called to McGill University as professor of natural history, afterwards becoming vice-chancellor. Dawson was recognized as an authority on Canadian geology, a subject to which he gave much study and contributed many valuable works. His name has been associated particularly with the controversy over the supposed fossil 'Eozoön,' which was found among the earliest rocks in the North American continent. He was also known as one of the ablest opponents of the application of the Darwinian theory to the origin of life forms. Among his important works are the following: *Acadia* (1851); *The Story of the Earth and Man* (1872); *The Dawn of Life* (1875); *The Origin of the World* (1877); *The Change of Life in Geological Time* (1880); *Egypt and Syria* (1885); *Modern Ideas of Evolution* (1890); *Some Salient Points in the Science of the Earth* (1894); and *The Meeting Place of Geology and History* (1894). In 1882 he received the Lyell medal of the Geological Society of London, and the same year he was elected president of the American Association for the Advancement of Science. In 1884 he was knighted. In 1886 he was president of the British Association for the Advancement of Science. He was also an honorary member of many American and foreign societies.

DAWSON, THOMAS CLELAND (1865—). An American lawyer and diplomat, born in Hudson, Wis. He graduated at Hanover College, Ind., in 1886, was admitted to the Iowa bar in 1886 and practiced law in Des Moines and Council Bluffs, Ia. In 1891 he became State Attorney-General, and from 1897 to 1904 was secretary of the United States legation to Brazil, when he was appointed minister and consul to Santo Domingo.

DAWSON, WILLIAM JAMES (1854—). An English clergyman and author. He was born at Towchester, Northamptonshire; was educated at Didsbury College, Manchester, and entered the Wesleyan ministry in 1875. He resigned from the Wesleyan ministry and entered the Congregational in 1892. In 1904 he resigned his charge in London to devote himself to evangelistic work. He wrote *A Vision of Souls* (1884); *Quest and Vision, Essays on Life and Literature* (1886; enlarged 1892); *The Threshold of Manhood* (1889); *The Makers of Modern Poetry* (1890); *The Redemption of Edward Strahan, A Social Story* (1891); *Poems and Lyrics* (1893); *London Idyls* (1895); *The Story of Hannah* (1896); *The House of Dreams* (1897); *Judith Boldero, A Tragic Romance* (1898); *Makers of Modern Prose* (1899); *Savonarola, A Drama* (1900); *The Life of Christ* (1901); *The Evangelistic Robe* (1905); *Makers of English Fiction* (1905); *The Forgotten Secret* (1906).

DAX. The capital of an arrondissement in the Department of Landes, France, on the Adour, 32 miles northeast of Bayonne by rail. The principal building is the former cathedral, rebuilt by Louis XIV. in the seventeenth century. The site of the ancient Roman walls and moat is now occupied by the Promenade des Remparts. Dax is famous as a health resort, owing to its thermal springs and baths of every description. It has a considerable trade in agricultural produce, wine, and timber, and manufactures liqueurs and pottery. The ancient capital of the Tarbelli, Dax was known to the Romans as Aquæ Tarbellicæ, afterwards as Civitas Aquensium. It passed through the hands of several conquering races, being last held by the English from the twelfth to the fifteenth century. Population, in 1901, 10,329.

DAY (AS. *dæg*, Icel. *dagr*, Goth. *dags*, OHG. *tac*, Ger. *Tag;* probably connected with Skt. *dah*, Lith. *dègti*, to burn, OPruss. *dagas*, summer). Originally the space of time during which it is light, in contrast to the space of darkness or night. It now more usually denotes a complete alternation of light and darkness. It is the earth's rotation that causes these changes of light and darkness. The earth being a globe, only one-half of it can be in the sun's light at once; that half enjoys daylight, while the other half is in its own shadow, or in night; and by the earth's rotation the several portions of the surface have each their turn of light and of darkness.

Astronomers recognize more than one kind of day. If the time is noted when a particular fixed star is exactly south or on the meridian, when the same star comes again to the meridian the next day, the earth has made exactly one rotation, and the time that has elapsed is called a *sidereal day.* This portion of time is always of the same length; for the motion of the earth on its axis is strictly uniform, and is perhaps the only strictly uniform motion that nature presents to us. Sidereal time, or star time, from its unvarying uniformity, is much used by astronomers. But the passage of a star across the meridian is not a conspicuous enough event for regulating the movements of men in general. It is not a complete rotation of the earth, but a complete alternation of light and darkness, that constitutes their day. This, which is called the *civil* or the *solar* day, is measured between two meridian passages of the sun, and is about four minutes longer than the sidereal day. The cause of the greater length is this: When the earth has made one complete turn, so as to bring the meridian of the place to the same position among the fixed stars as when it was noon the day before, the sun has in the meantime (apparently) moved eastward nearly one degree among the stars, and it takes the earth about four minutes more to move round so as to overtake it. If this eastward motion of the sun were uniform, the length of the solar day would be as simple and as easily determined as that of the sidereal. But the ecliptic or sun's path crosses the earth's equator, and is therefore more oblique to the direction of the earth's rotation at one time than another; and besides, as the earth moves in its orbit with varying speed, the rate of the sun's apparent motion in the ecliptic, which is caused by that of the earth, must also vary. The consequence is that the length of the solar day is constantly fluctuating: and, to get a fixed measure of solar time, astronomers have to imagine a sun moving uniformly in the celestial equator, and completing its circuit in the same time as the real sun. The time marked by this imaginary sun is called *mean solar time;* when the imaginary sun is on the meridian, it is *mean noon;* when the real sun is on the meridian it is *apparent* noon. It is obvious that a sun-dial must show apparent time, while clocks and watches keep mean time. Only in four days of the year do these two kinds of solar time coincide. In the intervals the sun is always either too fast or too slow; and the difference is called *the equation of time* (q.v.), because, when added to or subtracted from apparent time, it makes it equal to mean time. The mean solar day is divided into 24 hours, the hours into minutes and seconds. A sidereal day, we have seen, is shorter; its exact length is 23 hours, 56 minutes, 4 seconds of mean solar or common time. Astronomers divide the sidereal day also into 24 hours, which are of course shorter than common hours. In the course of a civil year of 365 days, the earth turns on its axis 366 times, or there are 366 sidereal days. Astronomers reckon the solar day as beginning at noon, and count the hours from 0 to 23. The civil day begins at midnight, and the hours are counted in two divisions of twelve each. The ecclesiastical day was formerly reckoned from sunset to sunset. See INTERNATIONAL DATE LINE; TIME, STANDARD.

To find the day of the week for any date, past or future, there are several methods, but the simplest and most easily understood is as follows: First, there is a 'constant' for the *style* —for new style it is 6, for old style 4. (In English chronology, new style begins 1752, September 14.) Then there is a 'constant' for each month—in new style, for January, 1; for February, 4; for March, 4; for April, 0; for May, 2; for June, 5; for July, 0; for August, 3; for September, 6; for October 1; for November, 4; for December, 6. (In leap years the constants for January and February are one less; that is, for January, 0; for February, 3.) Now (for new style), multiply the number representing the century by 5, and add one-fourth to the product (omitting fractions). For instance: In 1880 the century number is 18, which, multiplied by 5, makes 90, and one-fourth of 18 (omitting fractions) is 4; hence the product is 94. Next add the number of the odd years (besides the century number), and add one-fourth (omitting fractions) to their total. Next add the days of the month. Then add all these figures together, and finally divide the sum by 7; the remainder will show the day of the week, remainder of 1 showing the first day of the week, or Sunday; remainder of 2 showing the second day of the week, or Monday, etc.; no remainder showing the seventh day of the week, or Saturday. Example: What is the day of the week for January 1, 1901?

Constant for new style	6
Constant for the month (Jan.)	1
Century number (19) multiplied by 5	95
Add (one-fourth of 19)	4
Odd years	1
Add one-fourth of 1	0
Day of the month	1
Total	108

Divide 108 by 7 and the remainder is 3; so the year 1901 must begin on the third day of the week, or Tuesday.

For Old Style the constant is 4 and the number of the century is multiplied by 6, without addition of the one-fourth. The constants for months are the same as in New Style, and one-fourth (omitting fractions) is added to the odd year. Example for Old Style: On what day of the week did Columbus land on his voyage of discovery (October 12, 1492)?

Constant for Old Style	4
Constant for October	1
Century number (14) multiplied by 6	84
Odd years (92) one-fourth added	115
Day of the month	12
Total	216

Divide by 7 and the remainder is 6—i.e. the required day is the sixth day of the week, or Friday.

For leap-years, care must be taken in both Old and New Style to reduce the constants for January and February by one for each of those two months. See CALENDAR.

DAY. In law, the period of time between midnight and midnight within which a specified legal act may be performed. This entire period of twenty-four hours is the 'natural' day. The 'artificial' or conventional day (*dies artificialis*), or the 'legal' day, as it is sometimes called, varies according to the nature of the act to be performed. Coke, referring to the day of the appearance of parties in a suit, described it as extending from sunrise to sunset. For many purposes the legal day is limited to the usual business hours (q.v.), as of a bank or other business house, and its length is often determined by the hours observed by the community, or artificially determined by the usage of a particular calling. Thus the day of the stock exchange means the hours (say from 10 A.M. to 3 P.M.) within which deliveries of stock and settlements must be made, in order to avoid forfeiture or other penalty. Usually, the legal day is coextensive with the natural day.

'Court days' are those days of the year in which courts may lawfully sit and process issue, though in some parts of the United States the expression is used to describe the days on which the courts actually sit. In England and the United States, Sundays and certain holidays are generally not court days (*dies non juridici*), excepting for such acts as are necessary to the preservation of the peace. By a legal fiction, a day is for many purposes regarded as a point of time, and a fraction of a day disregarded. See DIES NON; TIME, STANDARD.

DAYS OF GRACE. The time at which a note is actually *due*, or *at maturity*, is in general by mercantile custom three days after the time expressed on the face of it, the additional days being called days of grace. If the third day of grace fall on a Sunday, the note is payable the day before. If it fall on a holiday, the note is payable the day after. The Negotiable Instruments Law in force in one-half of the States abolishes days of grace.

DAY, Benjamin Franklin (?—). An American naval officer, born in Ohio. He attended the United States Naval Academy in 1858-61, during the Civil War served with the West Gulf (1861-64) and North Atlantic (1864-65) blockading squadrons, and attained the rank of lieutenant-commander in 1866. In 1876 he became commander, in 1891 captain, in 1899 rear-admiral, and in 1900 was retired from the service. From 1897 to 1900 he was a member of the Naval Examining Board.

DAY, George Edward (1815-1905). An American theologian. He was born in Massachusetts; graduated at Yale in 1833, and in 1838 at the Yale Theological Seminary, where he was assistant instructor in sacred literature. From 1840 to 1851 he was in the ministry; from 1851 to 1866 he occupied the chair of biblical literature in Lane Theological Seminary; and from the latter date that of Hebrew language and biblical theology in Yale Divinity School. From 1863 to 1871 he was editor of the *Theological Eclectic*, and, besides contributions to periodicals, published a translation (1871) of the *Biblical Theology of the New Testament* of Van Oosterzee; an American edition (1883) of Œhler's *Biblical Theology of the Old Testament;* and other works.

DAY, Henry Noble 1808-90). An American author and educator. He was born at Washington, Conn.; graduated at Yale College in 1828, at the Yale Divinity School in 1834, and was ordained to the Congregational ministry. He became professor of sacred rhetoric in Western Reserve College in 1840, and was president of the Ohio Female College from 1858 to 1864. Besides numerous contributions to periodical literature, his works include: *The Art of Elocution* (1844); *The Art of Rhetoric* (1850); *Elements of Logic* (1867); *The Science of Esthetics* (1872); *The Science of Thought* (1886); *Elements of Mental Science* (1889).

DAY, James Roscoe (1845—). An American educator, born at Whitneyville, Maine. He studied at Bowdoin, was ordained a minister of the Methodist Episcopal Church, and in 1893 became chancellor of Syracuse University. He was elected bishop in 1904 but resigned.

DAY, Jeremiah (1773-1867). An American educator, born in New Preston, Conn. He graduated at Yale in 1795, was made professor of mathematics and natural philosophy there in 1803, and was president of the college from 1822 to 1846. He published *An Introduction to Algebra* (1814); *Navigation and Surveying* (1817); and several works on philosophy.

DAY, John (—c.1640). An English dramatist. He was born at Cowston, and in 1592 was admitted to Caius College, Cambridge, which he left the next year without a degree. Between 1598 and 1603 he collaborated with Dekker, Chettle, and others on at least twenty-two plays, of which only *The Blind Beggar* seems to have been printed. Day is remembered for a vivacious comedy, *The Isle of Gulls* (1606), and for a dainty masque, *The Parliament of Bees* (1641, but written much earlier). Consult: *Works*, ed. by Bullen (London, 1887); and Ward, *History of English Dramatic Literature* (London, 1899).

DAY, Thomas (1748-89). An English author. He was born in London, and was educated at Corpus Christi College, Oxford. He strongly sympathized with the Americans at the time of the Revolutionary War and expressed his views in *The Devoted Legions* (1776), and *The Desolation of America* (1777); but he also strongly denounced American negro slavery in *Reflections on the Present State of England and the Independence of America* (1762). He will be remembered, however, chiefly as the author of the famous *History of Sandford and Merton* (3 vols., 1783-89) and the *History of Little Jack* (1788). He was a character of remarkable nobility and expended almost his entire fortune in philanthrophy. His eccentricities, due to his refusal to compromise with worldliness, and his adherence to the doctrines of Rousseau, then recently promulgated, led him into many extraordinary experiences. He was killed by being thrown from a fractious colt, while testing a theory that all animals could be managed by kindness. His *Poems* may be found in vol. lviii. (1822) of the *British Poets*. Consult his *Life*, by Keir (London, 1791), and that by Blackman (London, 1862).

DAY, William Rufus (1849—). An American statesman and jurist. He was born at Ravenna, Ohio, graduated at the University of Michigan in 1870, studied law at the same place, and in 1872 he was admitted to the Ohio bar. He was elected to a judgeship in the Court of Common Pleas (1886-90). In 1897 he was appointed Assistant Secretary of State, and in 1898 Secretary of State. Later in the year he resigned his secretaryship and was named chairman of the United States Peace Commission which arranged terms of peace with Spain. From 1899 to 1903 he was Judge of the United States Circuit Court, and in February, 1903, was appointed an associate-justice of the United States Supreme Court.

DAY, Stephen. See Daye, Stephen.

DAYAL, dī'ȧl. See Dhyal-Bird.

DAY-BLINDNESS, or Hemeralopia. See Sight, Defects of.

DAYE, dā, or **DAY,** Stephen (1611-68). The first printer in the English colonies in America. He was born in London, was there a printer's apprentice, and in 1639 assumed charge at Cambridge, Mass., of the printing apparatus which the Rev. Jesse Glover had succeeded in obtaining for the colony. He continued in this post until 1649, when for reasons not ascertainable he was superseded. In 1641 the General Court ordered that he, "being the first that sett upon printing, is graunted three hundred acres of land." An action brought by him against President Henry Dunster, of Harvard, to recover £100 for alleged services resulted in a verdict for the defendant. His press-work is tolerable, according to Thomas (*History of Printing in America*, 1810), but his composition exceedingly deficient. He printed the *Freeman's Oath* (1639); *An Almanack, Calculated for New*

England, by William Pierce, mariner (1639); the first book printed in America, *The Psalms in Metre, Faithfully Translated for the Use, Edification, and Comfort of the Saints* (1640), commonly known as "The Bay Psalm-Book"; and other publications, for a list of which consult: Thomas, *The History of Printing in America* (Worcester, 1810); Timperley, *A Dictionary of Printers and Printing* (Manchester, 1839).

DAY-FLY. See May-Fly.

DAY-LILY (so called because the flowers usually last one day), *Hemerocallis.* A genus of plants of the natural order Liliaceæ, with bell-shaped flowers. Several species are cultivated in flower-gardens, especially the fragrant yellow day-lily or lemon lily (*Hemerocallis flava*), a native of Hungary, Siberia, and the north of China. It has also been recommended to farmers as affording a supply of a most acceptable green food to cattle. *Hemerocallis fulva*, a native of Europe and temperate Asia, produces more abundant foliage, and cattle are equally fond of it. Both species are fibrous-rooted perennials, with linear leaves. Five or six other species are met with in cultivation, forming a group of fine, hardy perennial ornamentals. The variety major of *Hemerocallis aurantiaca* is said to be the finest of all the day-lilies.

DAY OF BARRICADES. The name given to an insurrection of the Parisians on May 12, 1588, during the War of the Three Henrys. Henry III. had fortified himself in the Louvre, against Henry, Duke of Guise. The city guards failed him, the populace pushed forward barricades, and the Swiss guards were saved from massacre only by the intervention of the Duke of Guise. The insurrection against Mazarin, August 27, 1648, is also known as the Day of the Barricades.

DAY OF SECTIONS. The name given to an attempted assault on the Tuileries by the National Guard, on October 4, 1795, in order to compel the Convention to change its measures. The uprising was overcome by Napoleon, who on that occasion received his first appointment. After the first encounter the forces of the Convention disarmed the various sections.

DAY-OWL. An owl often seen abroad during the day. See Hawk-Owl.

DAYSMAN. An arbitrator, umpire, or judge. The term is of Anglo-Saxon origin, and is still employed in the northern part of England, to describe an unofficial judge or arbitrator to whom a matter in dispute is referred. It was in more common use in Wiclif's day, from whom it was taken over into the Authorized Version of the Bible, in the exclamation of Job: "Neither is there any daysman betwixt us, that might lay his hand upon us both" (Job ix. 33). The origin of the term is obscure.

DAY'S WORK. In nautical language, the navigation work done every 24 hours. The term is generally restricted to making the dead-reckoning computations. See Navigation.

DAY'TON. A city in Campbell County, Ky., on the Ohio River, opposite Cincinnati, Ohio, and on the Chesapeake and Ohio Railroad (Map: Kentucky, G 1). It contains the Speers Memorial Hospital. The city has large plants for the manufacture of watch-cases, pianos, and whisky. Settled in 1849, and incorporated the same year under the name of Jamestown, Dayton is now governed under a charter of 1893, by a mayor elected every four years, and a city council. Pop., 1900, 6104; 1906 (local census), 8537.

DAYTON. A city and the county-seat of Montgomery County, Ohio, in the rich and densely settled Miami Valley, on both banks of the Great Miami River, at its junction with the Stillwater and Mad rivers; 50 miles north by east of Cincinnati and 61 miles west by south of Columbus (Map: Ohio, B 6). Its steam railroads are the Erie; the Cincinnati, Hamilton and Dayton; the Pittsburg, Cincinnati, Chicago and St. Louis; the Cleveland, Cincinnati, Chicago and St. Louis; the Dayton and Union. The Miami and Erie Canal, connecting the Ohio River at Cincinnati with Lake Erie at Toledo, runs through Dayton, furnishing freight transportation and limited water power. Seven electric traction lines and many free pikes enter the city.

Dayton's area is eleven square miles, the original plat being regularly laid out with broad streets. There are 185 miles of improved streets, of which 34 miles are paved with asphalt, brick or stone. The system of storm and sanitary sewage is extensive and modern. Natural gas is largely used for domestic and heating purposes. The principal public buildings are the old court house, modeled after the Parthenon, the new court house, Steele High School, Dayton State Hospital, Saint Elizabeth Hospital, Miami Valley Hospital, and the Public Library and Museum. The last, standing in Cooper Park, contains 64,000 volumes and is supplemented by four branch libraries. There are seven national banks, two savings and trust companies and twenty building and loan associations. Cooper Park, Van Cleve Park, South Park, and the Boulevard constitute Dayton's park system. The National Military Home for Disabled Volunteers, one mile west of the city, accommodates over 6000 inmates. The public schools comprise one high, one manual training, and twenty-two district schools, with an enumeration of about 26,000. The Roman Catholics maintain a boys' college, a girls' academy, and eleven parochial schools.

Dayton ranks third among Ohio cities in invested manufacturing capital, in value of manufactured product, in workmen employed and wages paid. Manufactured articles include cash-registers, computing scales, electrical machinery, cotton-seed oil machinery, agricultural implements, lasts, sewing-machines, bicycles, cigars and cigarettes, blank books, paper, railway-cars, boilers, stoves, cotton and woolen goods, soap, carriages, beer, oil, flour, etc.

The city government is administered by a mayor; board of public service, elective; board of public safety, board of tax commissioners, board of sinking fund trustees, board of health, all appointed by the mayor; council, elective; auditor, treasurer, solicitor, elective. Annual income and expenditure amount to about $2,146,000 and $2,188,000, respectively; bonded debt, $3,016,000, chiefly contracted for street-paving, sewers, and water works extensions; public school receipts and expenditures, about $500,000 and $440,000; bonded school debt, $574,000.

Dayton maintains a steady healthful growth; adjacent territory is largely platted and improved, many among her business and industrial classes living beyond the corporate limits. The death rate is 13.08 in 1000. The water supply, furnished by the Holly system of deep wells, and under municipal ownership, is pure and abundant. Population, 1900, 85,333; 1906 (local est.), 105,000.

Dayton was settled in 1796, by a company of (19) persons from Cincinnati. The original town plat was laid out by Daniel Cooper. In 1805, the town was incorporated and was named in honor of General Jonathan Dayton, one of the earliest owners of the included territory. The first city charter was granted in 1841. In 1805, 1847, 1866, 1886 and 1898, destructive river floods occurred; since the last named year, the channel of the Great Miami has been straightened and the levee system so improved as to prevent further danger from this source. (Consult Robert W. Steele, *History of Dayton* (Dayton, 1889); Mary D. Steele, *History of Dayton* (ib., 1896).

DAYTON. A city and the county-seat of Rhea County, Tenn., 38 miles northeast of Chattanooga; on the Queen and Crescent Route (Map: Tennessee, F 5). Industries include coal mines, furnaces, machine-shops, flour and lumber mills, brick-yards, a chair-factory, etc. Population, 1890, 2719; 1900, 2004.

DAYTON. A city and the county-seat of Columbia County, Wash., 40 miles northeast of Walla Walla; on the Touchet River, and on the Washington and Columbia River Railroad, and a branch line of the Oregon Railroad and Navigation Company (Map: Washington, H 3). It lies in an agricultural and stock-raising country, and contains large flouring mills, and other manufacturing plants. The city has good water power. Population, 1900, 2216; 1906 (local est.), 3500.

DAYTON, Jonathan (1760-1824). An American soldier and legislator, born in Elizabethtown, N. J. He graduated at Princeton, was admitted to the bar, was appointed lieutenant in a New Jersey regiment in 1777, served under General Sullivan against the Six Nations, and in 1798 became a brigadier-general in the United States Army. He was a member of the New Jersey Legislature, and Speaker of the Assembly, and was a delegate to the Constitutional Convention of 1787. From 1791 to 1799 he was a member of Congress (being Speaker of the House from 1795 to 1799), and from 1799 until 1805 served in the United States Senate.

DAYTON, William Lewis (1807-64). An American politician, nephew of Jonathan Dayton (q.v.). He was born in Somerset County, N. J., graduated at Princeton in 1825, was admitted to the bar five years later, and began the practice of the law in Trenton. He became a member of the State Council or Senate in 1837, and in 1842 was appointed to fill a vacancy in the United States Senate. He was reëlected on the expiration of his term, and took an active part with the Whigs in opposing the extension of slavery, the annexation of Texas, and the Fugitive Slave Law. In 1856 he was the Republican candidate for Vice-President. He was Attorney-General of New Jersey from 1857 to 1861, and from then until his death was United States Minister to France.

D'AZEGLIO. See Azeglio, Marchese d'.

DAZZLE. A sharper who manages to introduce himself from Oak Hall, Squire Harkaway's home, in Dion Boucicault's *London Assurance.*

DEACON (AS. *dēacon*, from Lat. *diaconus*, from Gk. *διάκονος*, *diakonos*, attendant). A subordinate ecclesiastical officer. In apostolic times, the name was applied to those officials of the Church who had the charge of collecting and distributing the alms of the faithful and taking care of the poor and the sick (Acts vi. 1-8); and these seem to have been considered the characteristic functions of the diaconate as late as the Trullan Council of 692. Thus, we find Saint Laurence, Archdeacon of Rome, in the middle of the third century, making the care of the poor and the attendance upon Sixtus, his bishop, at the altar, his principal occupation and his pride, and it was as a deacon that Athanasius attended his bishop at the first general council of Nicæa, 325, and defended the faith against Arius. But that the office was not intended to be restricted to these functions may be inferred from the fact that immediately after its institution we find deacons teaching and even baptizing (Acts vi. 10; viii. 5, 38). It evidently included in very early times the duties of guarding the sacred assemblies from the presence of unworthy persons, receiving the oblations and bringing them to the priest, reading the epistle and gospel from the *ambo*, and the names of those who were inscribed on the diptychs for commemoration, and assisting in the administration of the holy communion. In matters of external ministry, they had a very wide range, which the Apostolic Constitutions sum up by saying that the deacon must be the ear, eye, mouth, hand, heart, and soul of the bishop. With the development of the subdiaconate and the minor orders, only the more important and honorable offices in and out of the church were left to the deacon. Owing to their small number (in early times not more than seven in any place), and to their immediate relations to the bishop, they began to assume considerable importance, and their pretensions had more than once to be restrained. The office of deacon as it existed in the Early Church has been preserved in the Eastern churches with little modification. At the present time in the Roman Catholic Church, the office is practically of no importance, as it is really nothing more than a step to the priesthood, which is usually administered almost immediately after ordination to the diaconate. The *Pontificale Romanum*, indeed, defines the duties of a deacon as ministering at the altar, baptizing, and preaching; but all duties specially belonging to the offices of deacon and subdeacon, including their special functions in a solemn mass, are in practice nearly always discharged by priests. The special ceremonies of the ordination of a deacon include the putting on of the dalmatic and stole, and the delivery to him of the book of the Gospels, as well as the laying on of the bishop's hands. In the Anglican Church the imposition of hands, and the delivery of the book of the Gospels, are retained. The deacon, who must be twenty-three years of age, continues a year in the office except in special cases. Besides pastoral work, preaching, and baptizing, he may read a large part of the service; but in England he is not allowed to hold a benefice. In the Methodist Episcopal Church, the deacon is a member of an order of the ministry next below the elder. The deacons are elected by the annual conference, and ordained by the bishop presiding. They may assist in the administration of the Lord's supper, may administer the rite of baptism, solemnize marriage, and serve as traveling preachers. In the Congregational churches, one or more deacons are elected by the members of each church to distribute the elements in the communion, to act as the advisers of the pastor, and as the almoners of the charities of the Church. The nature of the office is the same in the Presbyterian Church, where the deacons are elected by the congregation and ordained by the minister to assist the body known as the session of the church in the care of the poor, and in the general management of the secular affairs of the church. In the Lutheran churches of the United States, the deacon is a layman chosen to attend to the charities and temporalities of the congregation. Of recent years, there have been introduced into the statute law of a number of the States provisions by which deacons, by virtue of their office, become legal trustees of church property for the congregation, whether incorporated or unincorporated. Consult Seidl, *Der Diaconat in der katholischen Kirche* (Regensburg, 1884).

DEACONESS. One of an order of women in the Christian churches. Traces of the order appear in Apostolic times (Rom. xvi. 1; I. Tim. v. 9 sqq.) and deaconesses were generally found in the early Christian communities. Their duties were in general to supplement the work of the deacons and perform for members of their own sex such services as could with less propriety be performed by men. They assisted at the administration of baptism, acted as doorkeepers on the woman's side of the congregation, instructed the female catechumens, took charge of the sick and poor women, and were present at the interviews of the clergy with women. They were set apart for their work by laying on of hands and prayer by the bishop. In the earliest times, widows were generally chosen, and it was considered seemly that a deaconess should be of mature years. In the Western Church decrees of councils abolishing the order are found as early as the fifth century, and by the eighth it had entirely disappeared. In the East it lingered longer, but the duties became much restricted. The modern development of the institution in the various Protestant churches of Europe and America dates from the third decade of the nineteenth century. In 1836 Pastor Theodor Fliedner of the United Evangelical Church of Prussia founded a deaconesses' home at Kaiserswerth in Rhenish Prussia, which has served as a model for similar institutions in many parts of the world. The inmates of these houses devote themselves to charitable work, but take no vows and are bound to no fixed term of service. Provision is generally made for their instruction and training, and they are under the supervision of an inspector or superior. There are now many deaconesses' homes in Germany, and they are found in nearly all countries of Europe. In the Church of England much of the normal work of deaconesses is done by the various sisterhoods. In America an order of deaconesses was established in St. Andrew's Parish, Baltimore, of the Protestant Episcopal Church, in 1855. A canon was adopted by the General Convention in 1889, regulating the order and providing that members should have adequate preparation, both technical and religious, which should extend over a period of two years. Training schools meeting this requirement are now maintained in New York and Philadelphia. The General Conference of the Methodist Episcopal Church in 1888 made provision for the establishment of the order of deaconesses. There are now many homes belonging to that Church in the United States. The Lutheran Church also has several homes, the first having been organized in New York in 1852. The Presbyterian General Assembly in 1891 sanctioned the order. Consult: Potter, *Sisterhoods and Deaconesses* (New York, 1873); Robinson, *The Ministry of Deaconesses* (London, 1898); *The Church Quarterly, Review*, No. 94 (London, 1899), pp. 302 sqq.; Golder, *History of the Deaconess Movement* (Cincinnati, 1903). See SISTERHOODS.

DEAD, BOOK OF THE. The name given by Lepsius, and since generally applied, to the collection of magical and religious texts which, according to ancient Egyptian belief, formed a sort of guide and protection for the dead in their wanderings through the Lower World. It was placed in or near the coffin or in the armpits of the mummy. Hundreds of copies exist, some containing only a few chapters, while other rolls are over a hundred feet in length. Some of these copies are very elaborately written, and (especially in later times) are ornamented with colored pictures. The Egyptians themselves called the collection the book of 'coming forth in the day-time' (*piret em h(r)ou*), from the opening words of the first chapter, which promise the soul of the deceased the power of visiting the Upper World. This title does as little justice to the varied contents of the collection as that erroneously proposed by De Rougé ('the funerary ritual'). This strange collection is not to be regarded as a handbook of Egyptian theology; its character is chiefly magical, although some hymns to the gods are incorporated in it. The individual chapters date from various periods, although most of them seem to have come down from the time of the pyramids; some, perhaps, even from the prehistoric age. A few formed part of the earliest collection of magical funerary texts inscribed on the walls inside the royal pyramids of the Sixth Dynasty; but the majority belong to a different corpus, which can be seen in process of gradual formation under the Twelfth Dynasty. At that time these texts were written on the sarcophagi; under the Eighteenth Dynasty they were written in papyri, although the selection and order of the chapters fluctuated. A fixed canonical form, limited to about 165 chapters, was established in the Twenty-sixth Dynasty, though nothing is known in regard to the origin or the formation of the canon. Papyri of this late date were the first published. (Consult Lepsius, *Das Todtenbuch der Aegypter*, Leipzig, 1849, republished by Davis, 1894; De Rougé, *Ritual funéraire des anciens Egyptiens*, Paris, 1861-76.) Eventually it became evident that all late MSS. were very corrupt, and in 1876 E. Naville was appointed by the Congress of Orientalists to prepare a critical edition of the text in use from the Eighteenth to the Twentieth Dynasty. The Prussian Government, with characteristic liberality, lent its support to the work. The results of Naville's labor, which appeared in 1886, under the title, *Das ægyptische Todtenbuch der 18ten bis 20ten Dynastie*, show that even at the period covered by the learned editor's investigations, the texts were hopelessly corrupt and can only be understood by tracing them further back. Many facsimiles of MSS. with pictures have been published, chiefly by Budge (*Papyrus of Ani*, etc.). The best translation is that of Lepage Renouf (London, 1890); those of Birch (London, 1867), Pierret (Paris, 1882), and Budge (London, 1898, cheaper edition 1901) are not critical.

DEAD, BURNING OF THE. See CREMATION OF THE DEAD.

DEAD, JUDGMENT OF THE (in ancient Egypt). The Book of the Dead contains, in chapter 125, a picture representing the judgment which the defunct will undergo in the Lower World, before Osiris and forty-two judges of monstrous form, before entering into the fields of the blessed. Anubis, the god of the dead, and Thout, the god of wisdom, examine the deceased by weighing his heart in the sacred 'balance of justice.' The famous 'negative confession' enumerates forty-two capital sins, from which the deceased must be free, or, at least, must claim to be free. Should he fail to pass the ordeal, he is either handed over to be devoured by the monster, half hippopotamus, half crocodile, which represents the Egyptian Cerberus, or is thrown into the fiery lake. This judgment scene is frequently represented. A very confused passage of Diodorus would seem to state that such a judgment was held on earth at the interment of the deceased, and that a well-founded accusation could deprive even a king of his sepulture. The underlying truth seems to be that a ceremony, imitating the judgment, with priests in the mask of gods, and with the reading of the negative confession and the following acquittal, may sometimes have formed part of the funerary ritual.

DEAD COLOR. In painting, any color that has no gloss, or reflecting quality.

DEAD HEART, THE. The title of a play by Watts Phillips (1859), revised for Sir Henry Irving in 1889.

DEAD-LETTER OFFICE. A division of the Post-office Department, under the control of the First Assistant Postmaster-General at Washington, to which unclaimed or undeliverable letters and packages are sent from local post-offices. The official record for the year 1900 showed the receipt by this office of 7,536,158 pieces, of which 5,392,800 were letters. More than four millions of these letters and parcels were destroyed by the department, either because they did not contain the names of the sender or were of no value. Upward of two hundred and fifty thousand letters, containing money, drafts, checks, notes, money orders, or postage stamps, to the value of about $1,150,000, were returned to their senders, and the department derived as revenue from dead mail matter, which could not be returned, nearly $15,000. During the year 8194 magazines, illustrated papers, picture cards and the like, which could not be returned to the owners, were distributed among the charitable institutions of the District of Columbia.

DEADLY AG'ARIC. See FUNGI, EDIBLE AND POISONOUS.

DEADLY NIGHTSHADE. See BELLADONNA.

DEAD NETTLE (*Lamium*). A genus of plants of the natural order Labiatæ. The name dead nettle—popularly in some parts of England and Scotland, dee nettle—is also often extended to the genus Galeopsis, very similar to Lamium galeopsis, and sometimes distinguished by botanists as hemp-nettle. Lamium purpureum, Lamium album, and Galeopsis tetrahit, are very common weeds. The first two are sometimes boiled as pot-herbs in Sweden. The name is derived from the popular belief that the hairs of the dead nettle, particularly when the plant is dried, as in haymaking, cause irritation in the hands of persons handling them, which, extending through the system, occasionally terminates in death. They do not, however, seem to possess any poisonous property. Several of the species have become naturalized in various parts of the United States.

DEAD RECKONING. The computation of the ship's position from her movements as recorded in the log, and without having a recourse to astronomical observations. The chief elements from which the reckoning is made are: The point of departure, i.e. the latitude and longitude sailed from, or last determined; the course or direction sailed in (ascertained by the compass); the rate of sailing, measured from time to time by the log (q.v.); and the time elapsed. The various principles or methods followed in arriving at the reckoning from these data are known as *plane sailing*, *middle-latitude sailing*, etc. (See SAILINGS.) But the data themselves are liable to numerous uncertainties and errors, owing to currents, leeway (q.v.), fluctuations of the wind, changes in the declination of the compass, etc.; and therefore the results arrived at by the dead reckoning have to be corrected as often as is possible by observation of the heavenly bodies. See NAVIGATION; LATITUDE AND LONGITUDE; COMPASS.

DEAD SEA (Heb. *yām*, sea, or *yām hammelach*, salt sea, Gk. *θάλασσα τῶν ἁλῶν*, *thalassa tōn halōn*, salt sea, *ἀσφαλτίτις λίμνη*, *asphaltitis limnē*, asphalt lake, or *Σοδομῖτις λίμνη*, *Sodomitis limnē*, lake of Sodom, Lat. *mare mortuum*, Dead Sea, Ar. *Bahr Lūt*, sea of Lot). An inland lake, on the southeastern borders of Palestine (Map: Palestine, C 4), in which the course of the Jordan terminates. It forms a part of the deepest chasm on the earth's surface and has no outlet. The Jordan Valley begins to sink below the level of the Mediterranean in the neighborhood of Lake Huleh, about 90 miles north of the Dead Sea. The Lake of Gennesaret is 680 feet below sea-level, and the Dead Sea about 1295 feet. On the east the high plateau of Moab rises 3100 feet above the Mediterranean, about 4400 feet above the Dead Sea; on the west the plateau of Judæa rises about 2000 feet above the sea. The shores are abrupt, in many places precipitous; the formation is chiefly limestone, and there is no vegetation and but little animal life, save in a few places, as at Engedi, where there is water. The Dead Sea is fed mainly by the Jordan, which contributes 6,000,000 tons of water daily; a number of smaller streams also empty into it, chiefly from the east. The most important are the Wady Zarka Ma'in (the stream of Callirrhoe), Wady Mojib (Arnon, q.v.), Wady-ed-Dera'a on the east; Wady Tufileh on the south; Wady-en-Nar (Kedron) on the west. The length of the Dead Sea is 47½ miles, its greatest breadth 10 miles, its area 360 square miles. From the eastern shore a promontory called al-Lisan (the tongue) juts out into the lake and extends toward the north for about twelve miles. It is formed of white calcareous marl, salt, and gypsum, and rises 40 to 80 feet above the water, ending in a cliff 300 feet high. South of al-Lisan the lake is comparatively shallow (10 to 18 feet); the greatest depth is 1310 feet. The level of the water varies considerably with the season; it has been maintained that its volume is shrinking, the inflow not being equal to the loss by evaporation, but the evidence on this point is not satisfactory. The water contains about 25 per cent. of solid substances, common salt, chloride of magnesium, chloride of calcium, and many other ingredients. The specific gravity is about 1.16, and the human body easily floats on the surface. The lake contains no life of any kind, with the exception of a few microbes, and sea-fish put into its waters soon die. The Dead Sea has presented substantially the same appearance since the beginning of the Quaternary period. As a result of the elevation of the whole region out of the sea, after the close of the Eocene period, a fault or fracture was produced running the whole distance from the Gulf of Akabah to base of Mount Hermon. During the Pleiocene and Pleistocene epochs the character of the depression was considerably changed. The large rainfall and the melting of the snows of Mount Lebanon, during the subglacial period, added greatly to the volume of water pouring into the Jordan Valley, and formed a lake that included Lake Huleh, Gennesaret, and the Dead Sea. There is evidence that the water once stood as much as 1180 feet above its present level. At a subsequent stage it seems to have been only 378 feet higher than now. As the rainfall diminished and the climate grew warmer, evaporation increased. Beds of bituminous marl are found near the lake, and bituminous masses float on its surface, particularly at times when there are seismic disturbances. The region is not, as has been supposed, volcanic. The subsidence of the land in the southern part of the lake may have given rise to the legend of the four sunken cities. A pillar of rock salt in the Jebel Usdum range is to-day pointed out as Lot's wife. The name Bahr Lut, or its equivalent, cannot be traced beyond the period of Moslem occupancy. In the Fourth Book of Ezra (v. 7), the lake is called *mare Sodomiticum.* There is no passage in the canonical books of the Bible distinctly connecting the Dead Sea with Sodom and Gomorrah. An ancient glossator who explained 'the vale of Siddim' in Gen. xiv. 3 as 'the Salt Sea' may have erroneously supposed that the lake was once in historic times dry land. But the writer of Gen. xix. did not think of an inundation as causing the destruction of Sodom and Gomorrah, but of a rain of fire and brimstone from heaven. Consult: von Schubert, *Reise in das Morgenland* (Leipzig, 1837); Lynch, *Official Report of the United States Expedition to the Jordan and the Dead Sea* (Washington, 1852); Hill, "The Jordan and the Gulf of Akabah," in *Memoirs of the Palestine Exploration Fund* (London, 1896); Buhl, *Geographie des alten Palästina* (Freiburg, 1896); George Adam Smith, *Historical Geography of the Holy Land* (London, 1895).

DEAD SOULS, The. A novel by Gogol (1841), continued after the author's death by Dr. Zahartchenko, in 1857. In 1886 Isabel Hapgood published a translation, under the title, *Tchitchikoff's Journeys.* The title was suggested by the act of the villainous hero, who buys up the names of all the dead serfs (souls) he hears of, with the object of converting the apparently *bona-fide* serf-roll, thus created, into cash at a bank.

DEAD'WOOD. A city and the county-seat of Lawrence County, S D., in the extreme western part of the State; on the Chicago and Northwestern, and the Chicago, Burlington and Quincy Railroads (Map: South Dakota, B 5). It has a Masonic Temple, a Carnegie Library, and a government building. The city is the distributing and financial centre for the mining section of the Black Hills, yielding gold, lead, silver, and tin. There are smelting and cyanide reduction works, planing-mills, machine-shops, foundry, brick and lime works, and a large sliming plant. Deadwood was settled in 1876. Population, 1900, 3498; 1905, 4364.

DEAF MUTE. A person who is deaf and dumb. Those who are born deaf or who lose their hearing at a very early age are also dumb, because they have not learned to speak by hearing others speak. They should not, therefore, be classed with those who cannot articulate words because of defect in the speech centres of the brain or disease of the organs of articulation. Persons who have learned to speak, and then become deaf, do not become mute, though the quality of voice used is often harsh and unnatural; and if the deprivation of hearing occurred in childhood the voice often remains childish. Deafness from birth (congenital deafness) is probably due to arrest of development in the embryo. The condition is found in certain instances as a family trait, in families with neurotic inheritances. Alcoholism and insanity are found in such families; and, besides these, parental syphilis is frequently a causal influence in producing congenital deafness. The intermarriage of near relatives who inherit similar disease tendencies has been a large factor in the production of deaf offspring. Boudin, of Paris, asserts that about 25 per cent. of the deaf mutes of France are the offspring of consanguineous marriages. In England, Buxton places the figures at 10 per cent. in his experience. Bemiss, of Louisville, Ky., records that over 10 per cent. of the deaf and dumb throughout the country at large are the offspring of kindred parents. Howe, of Boston, gave similar testimony. The principal causes of acquired deafness have been noted under DEAFNESS.

In early historical times, statesmen, lawyers, and philosophers agreed that deaf mutes were incapable of being educated. Legally, deaf mutes were then almost everywhere in the same position as idiots and madmen. The Roman law held them to be incapable of consent, and consequently unable to enter into a legal obligation or contract. In France, deaf mutes were considered a disgrace to their parents, and were kept in seclusion in convents and asylums. Yet, examples of considerable capacity on the part of deaf mutes were not unknown in ancient times and in the Middle Ages. Pliny mentions a successful deaf-mute painter at Rome. The Venerable Bede, about the close of the seventh century, gives an account of a dumb youth who was taught by an early English bishop, Saint John of Beverley, to repeat words and sentences after him. Rodolphus Agricola, of Groningen (1442-

85), mentions a deaf mute who had received instruction and could write.

The credit for the first systematic examination of the problem from a philosophical point of view is due to Jerome Cardan (q.v.), whose conclusion was that "written characters and ideas may be connected together without the intervention of sounds." This authoritative declaration had the effect of arousing widespread interest in the problem, and Pedro Ponce de Leon (1520-84), a Spanish Benedictine monk, undertook to give regular instruction to the deaf and dumb. Pasch, a clergyman of Brandenburg, was the next teacher of note, and he was followed by Juan Pablo Bonet, secretary to the constable of Castile, Spain, also a Benedictine monk. Bonet published a work in 1620, which is the earliest known treatise on the subject, and which probably embodied the ideas of Cardan. It contained a manual alphabet differing much from that described by Bede, and in the main identical with the single-hand manual in use to-day. The treatise of Dr. John Bulmer, an English physician, followed in 1648; and this was succeeded by the work of Dr. Wallis, an Oxford professor of mathematics. In 1669 Dr. William Holder, rector of Bletchington, published a similar work, and in 1670 George Sibscote put forth another work. A very able and philosophical treatise was published in 1680 by George Dalgarno, of Aberdeen, Scotland, which received high praise from Leibnitz, together with an earlier work, to which Wallis and Wilkins are both said to be indebted. In the first rank among early teachers of deaf mutes stands John Conrad Amman, a Swiss physician residing in Amsterdam, who, in 1692, reduced the methods then known to an exact art, as described in his *Surdus Loquens.* France, late to recognize the possibilities of deaf-mute instruction, furnished many enthusiastic advocates of it, as Père Vanin, Ernaud, Rodriguez Pereira (a Spaniard who settled in France), and the Abbé Deschamps. Preëminent stands the Abbé Charles Michel de l'Epée (1712-89), of Paris, who systematized the instruction of deaf mutes in France, in 1760, in his own school. His successor, Sicard, as well as Itard, followed his methods. It was in 1760, also, that Thomas Braidwood established, at Edinburgh, the first private school for deaf mutes in the British dominions. This school, in which Wallis's plan of instruction was followed, was the model of the earlier British institutions. In 1783 this school was removed to Hackney, near London, and probably led to the establishment of the London Asylum, in 1792. Dr. Joseph Watson, a nephew and former assistant of Braidwood, was its first principal.

INSTITUTIONS. The first public school for deaf mutes was established at Leipzig, in 1778, under the direction of Samuel Heinecke (1720-90). The systematic instruction of the deaf and dumb, and the intelligent organization of institutions in which to educate them, date from the early part of the nineteenth century. An essay on *Teaching the Deaf to Speak*, by Dr. W. Thornton of Philadelphia, was published in 1793, and in 1811 a grandson of Braidwood tried to establish a school in New York and Virginia, but failed in both instances. The circumstances which led to the opening of the Connecticut asylum at Hartford, April 15, 1817, are as follows: A deaf-mute little girl in the family of Dr. Cogswell, an eminent physician in Hartford, attracting some attention, it was soon afterwards found that there were other deaf mutes in the country. It was decided to send some one abroad to acquire the art of educating them; and to establish a school for this purpose funds were raised, and the Rev. Thomas H. Gallaudet was selected for this work. He left the United States, May 15, 1816, to execute this mission. The institution was incorporated by the Connecticut Legislature in May, 1816, with an appropriation of $5000. Dr. Gallaudet returned to America in August of the same year, accompanied by Laurent Clerc, a deaf-mute pupil of the Abbé Sicard, and they immediately commenced collecting funds to start the school. The enterprise excited general interest; individuals and churches contributed liberally, and the sum of $12,000 was raised in the course of a few months. Early in 1819 the Government of Massachusetts followed the example of Connecticut by providing for the education in the asylum of twenty indigent pupils from that State. The appropriation was afterwards enlarged so as to meet the demands of this entire class. New Hampshire made a similar provision in 1821, and Vermont and Maine in 1825. In 1834 South Carolina and Georgia decided to send their indigent deaf mutes to the asylum, and in 1848 Rhode Island came into the same arrangement. In 1819 Congress made a grant to the institution of twenty-three acres of wild land, the proceeds of which now form a fund of $339,000. It was owing to this munificent gift that the name of the school was changed to the 'American Asylum.' Before the school at Hartford was in operation, efforts had been made to establish a similar institution in the city of New York; a society was formed which was incorporated April 15, 1817, as the "New York Institution for Instruction of the Deaf and Dumb." Watson's book was taken as a guide, and articulation was taught in cases where the scholar appeared to possess the necessary aptitude. But this method did not prove very successful; and in 1827 the Legislature, which had provided since 1822 for the support of 32 pupils, authorized an investigation by the superintendent of common schools of the State, who recommended in his report the introduction into the New York school of the improved methods in use at Hartford and Philadelphia. In consequence of that recommendation, the directors finally succeeded in engaging, in 1831, the permanent services of Harvey P. Peet, then one of the most efficient instructors in the American Asylum. He served as principal from 1831 to 1867, and had a worthy successor in his son, Isaac Lewis Peet. Under the management of these two able teachers the institution has taken a place among the most successful schools for deaf mutes in the world. Its grounds comprise about 26 acres, upon the banks of the Hudson River at Washington Heights, New York City. The institution has a shoe-shop, tailor-shop, and carpenter-shop, a printing-office, garden, and sewing-rooms connected with the school, in which the pupils receive competent instruction to prepare them for self-support by manual labor, as in all our large asylums. The Pennsylvania institution was organized at Philadelphia in 1820 by Joseph Seixas, a Portuguese Jew. Laurent Clerc was an instructor in it, as was Lewis Weld, its first principal. The Kentucky Asylum for Deaf

Mutes was incorporated at Danville in 1823. The Ohio institution was opened in Columbus in 1829. Virginia, Indiana, Tennessee, Illinois, North Carolina, Georgia, South Carolina, Missouri, Wisconsin, and Michigan followed the example during the succeeding quarter century, and now every State in the Union has an institution in which deaf mutes receive the privileges of education 'as wards of the commonwealth.' In most cases the State institutions are supported by annual legislative appropriations. This public provision includes expenses of transportation to and from the institution and all expenses while there. Most of the State institutions have school years corresponding to those of the public schools, and it is expected that friends or relatives will keep the children during the long summer vacation. The average term of attendance is about five years, but the legal period of instruction in most States is seven years. The average cost to the State is about $325 per year. According to the report of the Commissioner of Education for 1902-3, there were in the United States 127 schools (both public and private), with 11,932 pupils. The following table gives details regarding these:

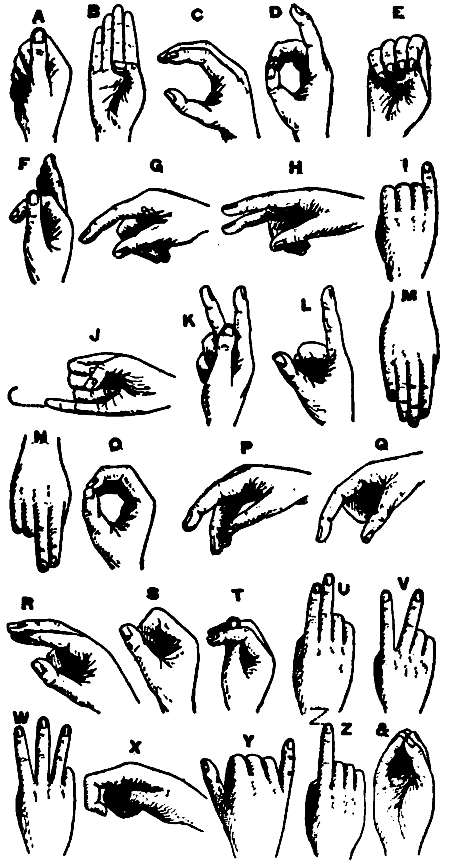
	State institutions	Public day schools for the deaf	Private schools
Number of schools......	56	54	17
Male teachers	384	5	19
Female teachers........	746	116	70
Total................	1,130	121	89
Articulation teachers....	468	99	60
Auricular perception teachers..............	43	50	16
Industrial teachers......	306	45	29
Male pupils.............	5,800	469	233
Female pupils	4,728	412	290
Total..................	10,528	881	523
Graduates, 1903.........	226	3	26
Taught by combined system...............	5,496	72	243
Purely oral.............	3,617	199	213
Manual method.........	2,842	11	98
Kindergarten...........	732	59	56

Public day schools for the deaf now exist in California (3), Illinois (18), Massachusetts (1), Michigan (7), Missouri (1), Ohio (6), and Wisconsin (18).

Besides those already mentioned, the names of the following Americans should be recorded as especially associated with the education of deaf mutes: Dr. F. A. P. Barnard, for many years president of Columbia College, New York City; William W. Turner, of Hartford; Abraham R. Walton, of Philadelphia; John A. Jacobs, of Kentucky; Dr. Samuel G. Howe, of Boston; and Thomas and Edward M. Gallaudet, sons of the Rev. Thomas H. Gallaudet.

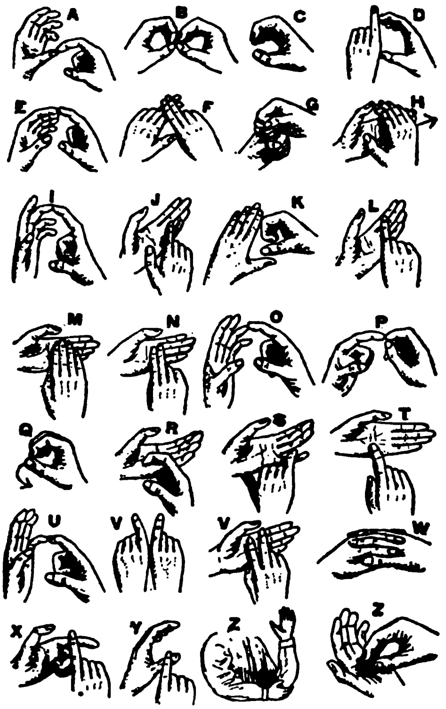
Some very remarkable examples of acute perception and great proficiency in deaf mutes have been recorded, notably the cases of Julia Brace, a pupil of Dr. Thomas H. Gallaudet, of Hartford; Laura Bridgman (q.v.), the celebrated blind deaf mute, a pupil of Dr. Howe, of Boston; and Helen Keller (q.v.), of Boston, in 1902 a college student of wide information and great intelligence.

Methods of Instruction. Two methods of instruction are used in teaching the deaf and dumb: by the *sign language*, and by *articulation*. By means of the sign language, ideas are communicated to the pupil through posture, gesture, facial expression, and mimic acting by the teacher. Nothing is spelled with the hands, in this method, as is erroneously supposed. Putting the hand to the head, as if putting on a cap, is the sign for 'man,' for example. This is an arbitrary sign. An example of a natural sign is raising the hand to the mouth and then chewing, to express 'food.' The sign language is easily and speedily acquired, and is said to be understood and used by the American Indians. The use of an elaborate sign language was carried to such extremes by the Abbé de l'Epée and his followers, Abbé Sicard and Abbé Storck, that their pupils relied entirely upon their memory, without any corresponding ideation. They proved to be incapable of composing sentences voluntarily, but simply memorized the gesture of the master. In some schools, after the pupil has become proficient in the sign manual, the use

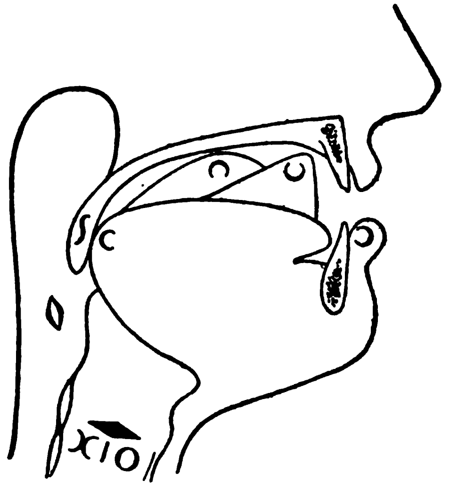


ONE-HANDED ALPHABET.

of the alphabet is introduced. The one-handed and two-handed alphabets are shown in the figures. Almost all pupils find the acquisition of *articulation*, or lip-reading, easier than that of the manual alphabet. In teaching by articulation, the pupil watches the lips and tongue of the teacher, and, by imitation of the motions seen, is able to speak. Consonants are taught first, and then the vowels. During the pronunciation of some sounds, the pupil grasps the teacher's throat and imitates the vibration and position of the muscles. This method is very slow, and pupils gain more general knowledge and with greater ease by the use of the *sign language*. In the celebrated Clarke school at Northampton, Mass., the old method of articulation was employed for a considerable time, but has been displaced by the Bell system. The method of teaching articulation by *visible speech* was invented by A. Melville Bell, professor of vocal physiology in Edinburgh, who introduced it in 1848. It was perfected and first used in the schools of Great Britain in 1869. In 1872 it was introduced into the Northampton school by A. Graham Bell, the son of the inventor of the method. The Bell system consists of a series of phonetic characters based on the position of the vocal organs when in action. The characters suggest to the eye the mechanism of speech in the formation of every possible sound that can be uttered. The following explanation of the system and of the characters is taken from Bell's *English Visible Speech in Twelve Lessons* (Washington, D. C., 1895). Dr. Bell adds that these explanations are for teachers only; for learners do not require to know the theory of the system.



TWO-HANDED ALPHABET.



C	Back of tongue	ʃ	Nasal passage open
∩	Top of tongue	X	Glottis, closed
∪	Point of tongue	|	" vocalizing
Ɔ	Lips	O	" open (aspirate)
0	Throat aspirate (whisper)		

A curved line means a consonant.
A straight line means a vowel.
A line within a curve means a vocal consonant.

CONSONANTS

The direction of the curve denotes:

To left (C) formation by back of tongue.

To right (Ɔ) formation by lips.

Convex above (∩) formation by top of tongue.

Concave above (∪) formation by point of tongue.

The varieties of curves denote:

Primary (C) central emission of breath.

Divided (3) side emission of breath.

Mixed (C) central emission of breath. } with modification by two parts of the mouth.

Mixed divided (Ʃ) side emission of breath. } with modification by two parts of the mouth.

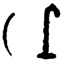
Shut (C) oral stoppage of breath with emission through the nose.

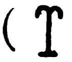
Nasal (C) oral stoppage of breath.

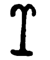
VOWELS

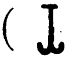
A point or a hook on a straight line denotes the vowel positions of the tongue. Thus:

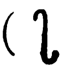
On left side of line (1), back of mouth.

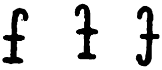
On right side of line (), front of mouth.

On both sides of line (), mixed back and front.

At top of line (), high.

At bottom of line (), low.

At both ends of line (), mid elevation.

A cross bar on a line denotes rounding or contraction of the lips. Thus: 

The symbols have the same value in all languages. Consequently, when the meaning of the symbols is known, the sound of any language may be deduced with certainty from their visible speech writing.

STATISTICS. The number of deaf mutes bears a certain relation to the population, being far greater in countries wherein squalor, privation, or medical ignorance and unhygienic conditions prevail. The ratio of deaf mutes to population is as follows, for the different countries named: Sardinia, 1 to 760; Nova Scotia, 1 to 880; Ireland and Norway, 1 to 970; France, 1 to 1200; Prussia, 1 to 1675; England, 1 to 1970; Holland, 1 to 2000; United States, 1 to 2400.

BIBLIOGRAPHY. A. Graham Bell, *Deaf Mute Instruction in Relation to the Work of the Public Schools* (Washington, D. C., 1884); Garrett, *Directions to Parents of Deaf Children* (Washington, D. C., 1886); Peet, *The Family Instruction of the Deaf in Early Childhood* (Washington, D. C., 1886); E. M. Gallaudet, *The Combined System of Educating the Deaf* (Washington, D. C., 1891). Gordon's *Notes and Observations Upon the Education of the Deaf* (Washington, D. C., 1892); Nitchie, *Self-instructor in Lip-reading* (New York, 1903), contains information on the American schools for deaf mutes.

DEAFNESS (AS. *dēaf*, OHG. *toup*, Ger. *taub*, Goth. *daubs*, deaf; probably originally dull of sense; cf. MHG. *tump*, stupid, OHG. *tumb*, deaf, dumb, Gk. *τυφλός*, *typhlos*, blind). Complete or partial imperfection of hearing that may affect both ears or one, may and may not date from birth, and may be either permanent or temporary. Among the numerous possible causes of deafness, the following deserve mention here: (1) Wax in the ear touching the drum membrane; (2) swelling of the lining membrane of the Eustachian tubes, the canals that lead from the upper part of the throat to the middle ear, one on each side; (3) perforation of the drum membrane; (4) middle-ear disease, during which exudation accompanying inflammation collects behind the drum membrane, or about the ossicles (the small bones of the ear), or during which adhesions form between the ossicles, stiffening their joints so that they cannot move freely against each other; (5) internal-ear disease, either labyrinthine trouble or affection of the eighth nerve; (6) diseases of the brain involving some of the auditory centres; (7) mumps, measles, scarlet fever, and some other diseases, are accompanied by middle-ear disease; (8) quinine and the salicylates cause temporary deafness; (9) sudden concussion sometimes ruptures the drum of the ear, and constant noise, like that in a boiler-shop, injures the auditory nerve from over-excitation.

The treatment of deafness depends of course upon its cause. Wax should be removed by syringing or curetting. Closure of the Eustachian tubes is treated by catheterization and local applications. In cases of perforation, the drum may grow again, after the cure of middle-ear disease, or may be remedied by the application of a paper disk. Middle-ear diseases may be cured by treatment through the Eustachian tubes, or may necessitate the operation of trephining through the skull back of the external ear. The ossicles may be removed in part, leaving the foot plate of the stirrup-bone in position, closing the oval window in the labyrinth, and clearing out the remains of the drum membrane; in which case the waves of sound strike the stirrup-plate in place of the drum membrane and are conducted to the nerve-filaments. Internal-ear disease may be relieved by internal medication, but is generally permanent. See EAR; DEAF MUTE; NERVOUS SYSTEM.

DEÁK, dĕ'äk, FERENCZ (Francis) (1803-76). An Hungarian statesman, born at Söjtör, in the County of Zala. He studied law at Raab, practiced as an advocate in his native county, and soon became noted for his eloquence and enlightened patriotism. Elected in 1832 to the National Diet, Deák, as leader of the Liberal opposition, resisted every attempt of the Imperial Government to infringe on the constitutional rights of Hungary. At the same time he labored for its internal improvement, promoting measures for the elevation of the peasantry, and advocated the abolition of exemption from taxes enjoyed by the nobility, of which he was himself a member. His views on the last point displeased a portion of his constituents, and he declined to serve in the Diet of 1843-44, but he continued to direct the policy of the Moderate Liberal Party. After the Revolution of March, 1848, he became Minister of Justice in the Cabinet of Count Batthyányi (q.v.), and formed the project of effecting a general reform in the administration of justice in Hungary, which, however, the revolutionary war rendered impossible. Deák used every effort to ward off the struggle and to arrive at an arrangement with Austria. When the rupture seemed inevitable and the Committee of Defense was formed, with Kossuth at its head, Deák resigned his portfolio. At the close of 1848 he was sent to the camp of the Austrian commander, Windischgrätz, to negotiate for peace, but the attempt failed. Deák was arrested, but was soon released and took up his abode at Pest. Though repeatedly invited to act as mediator between the dynasty and the Hungarian nation, Deák did not return to public life until 1860, when Francis Joseph promised to restore to Hungary its constitutional liberties. Returned by the city of Pest to the Diet in 1861, he became the acknowledged leader in that assembly. In May the Diet appointed him to draw up the address to the Emperor. This address demanded the restoration of the Constitution of 1848, and an independent Hungarian Ministry. The Emperor thereupon announced the dissolution of the

Hungarian Diet. After the disastrous issue of the war between Austria and Prussia in 1866, the Emperor found himself compelled to accede to all the demands of Hungary, as formulated by Deák. The Austrian monarchy was reorganized on its present dualistic basis, and Francis Joseph was crowned with great pomp as Constitutional King of Hungary in 1867. Deák remained until his death (January 29, 1876) the leader of his party in the Diet. Deák is universally admitted to have been one of the ablest of European statesmen. He was a man of the loftiest character, kindly and simple in his ways. As an orator he was irresistible by the sheer force of his logic. Consult: Forster, *Francis Deák, Hungarian Statesman* (London, 1880); and Laveleye, "Ferencz Deák," in *La Prusse et l'Autriche* (Paris, 1870); Csengery, *Franz Deák*, authorized German translation by Heinrich (Leipzig, 1877-78).

DEAKIN, Alfred (1856—). An Australian statesman, born in Melbourne. He studied at the university of his native town, and was elected to the Victorian parliament in 1879. In 1883 he was colonial minister of public works, and in 1885 became solicitor-general. Two years later he represented Victoria in the Imperial Conference at London, and subsequently took active part in the movement for Australian federation. He was attorney-general in the first Commonwealth ministry 1901-3, and in the latter year succeeded Sir Edmund Barton as premier and leader of the Protectionist party. His ministry was overthrown in April, 1904, but he formed a new government in July, 1905. He published several works on irrigation in different countries.

DEAL (formerly *Dole*, from Icel. *dalr*, Norw. *dal*, Engl. *dale*). A municipal borough, market town and sea-bathing place, in Kent, England, on the North Sea, between North and South Foreland, eight miles north-northeast of Dover (Map: England, H 5). The fine anchorage of the Downs extends seven or eight miles between Deal and the Goodwin Sands. The chief branches of industry are connected with maritime pursuits, boat-building, sail-making, piloting or hoveling, victualing, and naval stores. Population, in 1891, 9000; in 1901, 10,600. Deal has been one of the Cinque Ports since the Thirteenth Century. The coast near Deal was formerly defended by three castles, built by Henry VIII. These are Deal Castle, Sandown Castle, and Walmer Castle. The last, in which the Duke of Wellington died in 1852, is now the official residence of the Lord Warden of the Cinque Ports. Julius Cæsar, with two legions in 82 ships, landed at Deal in B.C. 55.

DEAL (Dan. *deel*, Ger. *Diele*, board, plank, AS. *thel*, plank, *thille*, board). The trade-name for fir boards exceeding six feet in length and seven inches in width. Pieces of smaller dimensions are called battens. Deal are usually three inches thick, and when sawed into thinner pieces they are called boards. When a deal is sawed into twelve or more thin planks, they are called leaves.

DEALFISH (*deal*, a board, plank; refers to the shape of the fish). A ribbon-fish (q.v.), especially of the genus Trachypterus.

DEAL ISLAND. An island of the Kent Group between Australia and Tasmania (Map: Victoria, G 7). It has a lighthouse, and rises 949 feet above the sea.

DEAM′BULATORY (Lat. *deambulatorium*, a gallery for walking, from *deambulare*, to walk abroad, to promenade). An open walk or passage, covered with ceiling or vault; either straight, like the deambulatory of a cloister, which incloses its four sides, or curved, like the deambulatory or aisle around the choir of a Gothic cathedral. Sometimes a deambulatory is outside a building. In the large, uncovered Roman basilicas the colonnades inclosing the central space are deambulatories.

DE AMICIS, dȧ ȧ-mē̆′chēs, Edmondo. See Amicis, Edmondo de.

DE AMICITIA, dē ăm′ĭ-sĭsh′ĭ-a, or **LÆ′LIUS**. A treatise by Cicero on friendship, written in B.C. 44, and dedicated to Titus Pomponius Atticus. The time is supposed to be B.C. 129.

DEAN (ME. *deen*, OF. *deien*, Fr. *doyen*, from Lat. *decanus*, one set over ten persons, from Lat. *decem*, *Gk. δέκα, deka*, Skt. *daśa*, ten). The title of certain dignitaries, particularly ecclesiastical and academic. In the ecclesiastical sense, the title was originally adapted from the Roman civil administration, in which were officers called deans, mentioned in the codes of Theodosius and Justinian. It was customary at one time in the monasteries to appoint a *decanus* over every ten monks, to take charge of their discipline. On the introduction of the canonical life (see Canon) among the clergy attached to cathedrals, this title was applied in many places to the head of the chapter (q.v.); but as early as the time of Saint Jerome, it was customary to have a similar officer attached to the bishop's immediate staff under the title of *archipresbyter*. In modern German cathedrals the dean is frequently subordinate to the provost, and has executive and partly secular functions. He is appointed usually by the bishop, but sometimes by the sovereign or the chapter. The deans of English cathedrals are appointed by the Crown, and required to reside for eight months in the year. The income of the office varies from £3000 in the case of Christ Church, Oxford, down to £500 at Chichester. The title in this sense is used in a few dioceses of the American Episcopal Church, though the functions connected with it are generally rather vaguely defined. There are also in England *deans of peculiars*, the incumbents of certain churches formerly, though not now, collegiate, as of Battle, in Sussex, founded by William the Conqueror, in memory of his conquest; of Bocking, in Essex; and of Croydon, in Surrey. The deans of Westminster and Windsor are also deans of peculiars, the Abbey and Saint George's Chapel being exempt from the jurisdiction of the bishops in whose diocese they are situated. There have been also from very ancient times, both in England and on the Continent, *rural deans* whose duty it is to visit a certain number of parishes and report on their condition to the bishop; the more important and formal part of their functions has, however, been transferred to the archdeacon. Similar officers in America are known as deans of convocations.

In the universities of Oxford and Cambridge the dean is the officer in each college who superintends its discipline, except in the case of Christ Church, Oxford, which is both cathedral and college, and where the dean is head of the college. The title is still sometimes used in America in its earlier sense as designating the presiding or senior officer of an academic faculty; and in German universities each faculty elects a dean annually, who presides over its meetings, represents it in external relations, and supervises both teachers and students.

In a special sense the word is applied to the oldest member in length of service of a body of persons of equal rank, such as a diplomatic corps, or to the president of an incorporated body of lawyers. It is in the latter sense that the chief judicial officer of the Archbishop of Canterbury is called the Dean of the Court of Arches. The dean of the Sacred College is the senior cardinal-bishop, who always occupies the see of Ostia. He presides at the meetings of the Sacred College in the absence of the Pope. He has the privilege of wearing the *pallium* in all ceremonies pertaining to his office, of consecrating the newly elected Pope in case he should not be already a bishop, and in any case of presiding at the coronation ceremonies. See Cardinal.

DEAN (AS. *denn*, valley), Forest of. A hilly tract, 22,000 acres in extent, in the west of Gloucestershire, England, between the Severn and the Wye. It is partly Crown land. It was formerly a vast source of timber supply for the British Navy, and half of it still remains inclosed for that purpose. It contains oak, beech, and other woods, orchards, stone-quarries, coal and iron mines. The iron shafts have been worked since Roman times. A populous mining district, it gives its name to a Parliamentary division which includes nearly all of Gloucestershire west of the Severn.

DEAN, Amos (1803-68). An American jurist. He was born in Barnard, Vt., and graduated at Union College in 1822. He soon gained renown as a lawyer, and his treatises on legal subjects were recognized as authoritative. In 1839 he became professor of medical jurisprudence in the Albany Medical School, and in 1851 professor of law in the newly founded law-school at Albany. He also served as chancellor and professor of history at the University of Iowa in 1855. His works include: *Lectures on Phrenology* (1835); *Manual of Law* (1838); *Philosophy of Human Life* (1839); *Medical Jurisprudence* (1854); *Bryant and Stratton's Commercial Law* (1861); and an unfinished *History of Civilization* (7 vols., 1869-70).

DEANE, Charles (1813-89). An American author. He was born in Biddeford, Maine; was educated at Saco, and in 1832 went to Boston, where he was a merchant for twenty-two years. He early acquired a taste for American history, and at the time of his death had accumulated a valuable collection of rare Americana. Among his publications are: *Some Notices of Samuel Gorton* (1850); *Memoir of George Livermore* (1869); and *The Forms in Issuing Letters Patent by the Crown of England* (1870). He also edited Bradford's *History of Plymouth Plantation* (1856); Wingfield's *Discourse of Virginia* (1860), in which was first seriously questioned the authenticity of the famous Pocahontas rescue story; and John Smith's *True Relation* (1866).

DEANE, James (1801-58). An American physician and naturalist, born in Coleraine, Mass. He was the discoverer, in 1835, of the fossil footprints in the red sandstone of the Connecticut Valley, later more fully investigated by Professor (afterwards President) Edward Hitchcock. On this subject he wrote *Ichnographs from the Sandstone of Connecticut River* (1861). He also published many articles on medical subjects.

DEANE, Lucy. Maggie Tulliver's cousin and amiable rival in George Eliot's *The Mill on the Floss*.

DEANE, Silas (1737-89). An American diplomatist during the Revolutionary War, who passed the latter part of his life in England. He was born in Groton, Conn., graduated at Yale in 1758, was admitted to the bar in 1761, became an active member of the 'patriot' party on the approach of the Revolutionary War, and was a delegate from Connecticut to the first and second Continental Congresses. In February, 1776, largely through the influence of Robert Morris, he was appointed by Congress business agent of the United States at Paris, where he entered upon his duties in July of the same year. Until Franklin's arrival he acted virtually as the official delegate of the United States to the French Court, and, besides securing and transmitting supplies, induced many French officers—sometimes by lavish and ill-advised promises—to take service in the American Army. In December he became one of the three commissioners from Congress to France. Soon afterwards he was charged indirectly by Arthur Lee (q.v.), one of his associates, with having misappropriated part of the public funds, and toward the close of 1777 Congress sent a summons to him to return, ostensibly to communicate information concerning the attitude of European Powers toward the United States. Before this order reached him, he signed, together with the other commissioners, the treaties of commerce and alliance with France, early in 1778. Immediately upon his return he was asked to render a detailed account of his financial transactions, but failed to satisfy Congress, which persistently refused to authorize a settlement of his accounts. "No proof appears that he had been dishonest," says the historian Hildreth, "or had employed the public money in speculations of his own, as his enemies alleged; but he had occupied the unfortunate position of having large sums of public money pass through his hands before any proper system of vouchers and accountability had been established, and he fell before the same spirit of malignant accusation which presently assaulted Wadsworth, Greene, Morris, and even Franklin himself, but which they had better means of warding off" (*History of the United States*, iii., 269). Deane soon returned to France, largely for the purpose of straightening out his accounts, and subsequently became convinced that the Revolution was destined to fail and that the United States should again become colonies of England. Late in 1781 *Rivington's Royal Gazette* (New York) published a series of 'intercepted' letters written by him (at the instigation, it has been charged, of George III. and Lord North) to prominent Americans, in which he strongly opposed the Declaration of Independence and the French alliance, and urged prompt submission to Great Britain. For this he was considered a traitor by a large element of the patriot party. In 1842 Congress at last adjusted Deane's accounts and paid to his heirs about $37,000. Dean published, in defense of his conduct, *An Address to the Free and Independent Citizens of the United States* (Hartford and London, 1784). A part of his correspondence in 1774-76 is given in the *Papers of the Connecticut Historical Society,* vol. ii.

(Hartford, 1891), and much of his diplomatic correspondence, together with a biographical sketch, may be found in Wharton (editor), *The Revolutionary Diplomatic Correspondence of the United States* (6 vols., Washington, 1889). Consult also *The Deane Papers* (5 vols., New York, 1886-90), published by the New York Historical Society; and *Papers in Relation to the Case of Silas Deane* (Philadelphia, 1855), published by the Seventy-six Society.

DEAN OF GUILD. Formerly the head of trade guilds in Scotch towns; now a corporation official.

DEAN OF THE CHAPEL ROYAL. An office held by six (formerly three) clergymen of the Established Church of Scotland, to which they are appointed by the Crown. The benefice of the Chapel Royal, which was instituted by James V., was richly endowed. The duties of the office used to be nearly nominal; but on the foundation of a chair of biblical criticism in the University of Edinburgh, in 1846, it was endowed with one-third of the revenues, the professor becoming one of the three deans. The Universities Commission (1858) recommended that when the requisite vacancies occurred the revenues should be divided into six parts, attached respectively to the chairs of divinity and biblical criticism in Edinburgh University (the latter receiving two-sixths of the whole), biblical criticism in Aberdeen University, biblical criticism in Glasgow University, and church history in Saint Andrews University. As a result of this arrangement, the revenues of the Chapel Royal are divided among the incumbents of the abovementioned chairs. Besides these five deans, the dean of the Order of the Thistle bears the title of Dean of the Chapel Royal, but draws none of the revenues.

DEANS, David, Effie, and Jeanie. The family about which centred the plot in Sir Walter Scott's novel *The Heart of Midlothian.* The father is a stern Cameronian, deeply shocked at the accusation made against his daughter, Effie, of having murdered her illegitimate child. Jeanie, who obtains pardon for her half-sister by walking all the way to London and securing the sympathy of the Duke of Argyll, is the heroine of the tale.

DEAR'BORN, Fort. See Fort Dearborn.

DEARBORN, Henry (1751-1829). An American soldier, born in North Hampton, N. H. He studied medicine and became a physician, but left his practice upon receiving the news of Lexington, entered the army as captain in 1775, and served throughout the Revolution, and distinguished himself at Quebec (where he was taken prisoner), Saratoga, Monmouth, and Yorktown. He was Secretary of War under Jefferson from 1801 to 1809, and at the outbreak of the War of 1812 was appointed senior officer in the army, with the rank of major-general, and was assigned to the Northern Department. He captured Toronto (then York) and Fort George, but in July, 1813, was recalled and placed in command at New York. He resigned from the army in 1815. From 1822 to 1824 he was Minister to Portugal.

DEARTH, Henry Golden (1863—). An American painter, born at Bristol, R. I. He was a pupil of Hébert and Aimé Morot in Paris, and became a member of the Society of American Artists in 1889. There is much charm in his carefully painted evening scenes, and he has the quality of atmosphere that gives every subject touched by him individuality. The scenery of Long Island and Connecticut was the theme of many of Dearth's paintings.

DEATH, Brethren of. The name given to the hermits of the Order of Saint Paul, an order formed in the thirteenth century, but suppressed by Pope Urban VIII. about 1630. They dressed in a black habit marked with a skull, and saluted each other with the words, "Remember that you must die."

DEATH, Dance of. A literary or pictorial representation of the power of death over the life of men. The subject was at first presented as a church play, preceded by an exhortation and ending with an appropriate sermon. (See Miracle Play; Mystery; Morality.) Probably because of the importance of the Maccabee brothers and their mother in the earlier representations, the French and other Latin peoples call it the '*Danse Macabre*,' or some equivalent name. The play consisted of a dialogue between Death and representatives of the various classes, churchmen and laymen, from the Pope and the Emperor down. Death invited them to follow him, and each unfortunate representative, after long remonstrances, submitted to the call, invoking God's mercy. At first Death was represented in an earnest and solemn manner, but soon his attitude took the character of a dance. Such plays were given in all countries where the Latin Church prevailed, and in Italy we find another version of the same subject, rendered popular by Dante and Petrarch, the "Triumph of Death."

It was soon found more efficacious, however, to have the subject portrayed by painters and sculptors upon the walls of the church or the cemetery. The most famous example of the "Triumph of Death" is the fresco of the Campo Santo of Pisa (fourteenth century), wrongfully ascribed to Andrea Orcagna. Among the oldest French examples of the 'Dance of Death' was that in the Cemetery of the Innocents, Paris (1425). Others still exist in France, as well as in England, Germany, and Spain. The subject is often pictorially represented in the manuscripts of the fifteenth and sixteenth centuries, and in many woodcuts of the fifteenth and following centuries. The most famous of the latter are the two designed by Holbein, the smaller engraved by Lützelburger (1520), while the larger appeared in book-form in 1538 (at Lyons) and many times since. The subject has also been represented in the nineteenth century, the most famous representation being that of Rethel (1848), directed against the French Republic. It has also been admirably treated in music, especially by Saint-Saëns in his *Danse macabre*, and in literature, as, for example, in Goethe's ballad, *Der Todtentanz.*

Consult: Douce, *The Dance of Death* (London, 1833); Langlois, *Essai sur les danses des morts* (Rouen, 1851); Kastner, *Les danses des morts* (Paris, 1852); Wackernagel, "Der Todtentanz," in *Kleinere Schriften*, i. (Leipzig, 1874); Seelmann, *Die Todtentänze des Mittelalters* (Norden, 1893); Vigo, *Le danze macabre in Italia* (Livorno, 1878); Merino, *La danza macabre* (Madrid, 1884).

DEATH ADDER. Any of several deadly Elapidæ Australasian viviparous snakes, especially the spine-tailed *Acanthophis antarctica*, which is widely distributed from South Australia to the Moluccas, and resembles in form and color an American rattlesnake. The end of the tail "is laterally compressed, beset with a few rows of large imbricating scales, and terminates in a thin, horny spine." Dr. Gadow thinks the use of this peculiar tail "very probably consists in attracting or fixing the attention of small animals; the snake, lying coiled up on a dry and sandy spot, slightly raising and vibrating the tip of the tail." It feeds mainly on frogs and young birds. Another species greatly feared is the larger and more cylindrical purplish adder (*Pseudechis porphyriaceus*), or 'blacksnake,' which may reach seven feet in length, and is purplish-black, varying in different specimens to dark olive-brown, with carmine sides and red belly, specked with black. A third species, especially dangerous, although smaller, because of its resemblance to the harmless serpents, is the short death adder (*Holocephalus curtus*), also known as the broad-headed, tiger, or brown-banded snake. It is very variable, but the head, which has a peculiarly square outline, is "generally uniform black, the body olive color, with broad brown or black cross-bands, the hinder part of the body . . . blackish, and the whole of the under parts light-yellow." Its venom is immediately fatal to animals generally, but seems not to be so to itself or other poisonous snakes. Thirty or more young are brought forth annually by a single pair, and the species is common everywhere on the Continent. It buries itself in the ground during the cold season. The genus Holocephalus has several other species in Australasia and the south seas. One of these, the large-scaled (*Holocephalus superbus*), is the dreaded diamond snake of Tasmania; another is the smaller, broad-headed snake (*Holocephalus variegatus*) of the neighborhood of Sydney; a third (*Holocephalus nigrescens*), of the southeastern coast of Australia, is remarkable for its white tongue. Consult Kreft, *Snakes of Australia* (Sydney, 1869).

DEATHBED, Law of. A peculiar doctrine of the Scottish law, derived from the later Roman law, whereby if any man, while suffering from the disease of which he ultimately died, burdened or conveyed away his heritable estate to the prejudice of his lawful heir, he was presumed to have so acted in consequence of his inability to resist importunity in the state of feebleness to which he was reduced, and his heir was entitled to avoid the deed. Two tests were fixed upon by the law as establishing the existence of a requisite degree of capacity—viz. survival of the donor for sixty days, and his going unsupported to kirk or market. It was of no consequence that the object of the visit was neither to worship nor to buy and sell, but simply to evade the law of deathbed. If the individual was in a condition to take part in the service of the church, or in the trade of the market, that was sufficient. Extreme old age, accompanied by manifest indications of the approach of death, were held equivalent to disease. But the deed of the oldest or most infirm man, or of the man who was laboring under the most mortal sickness, was not voidable if another disease had supervened of which he died, or if he were killed by accident. See Duress; Undue Influence.

DEATH-CUP. See Fungi, Edible and Poisonous.

DEATH DUTIES. The comprehensive English term for a variety of specific duties levied under acts of Parliament on the estates of deceased persons. Included under the term are (1) probate duties, (2) account duties, (3) legacy duties, (4) succession duties, and (5) estate duties.

The *probate duty* dates back to the year 1694, and was a stamp duty levied as the price of obtaining probate or letters of administration. It has now, since 1894, been superseded by the estate duty. The *account duty* was of later origin, and was payable by the beneficiary of a decedent. It has also been superseded by the estate duty. The *legacy duty* was created by statute 20 Geo. III., c. 28 (1780), and is a stamp tax on receipts given by legatees to executors for their legacies. It varies in amount from 1 to 10 per cent. of the legacy, according to the nearness of the relationship of the legatee to the decedent. When the legatee is a lineal descendant or ancestor of the deceased, the duty (1 per cent.) need not be paid if an estate or other death duty has been paid. *Succession duty* was created by act of Parliament in 1853 (16 and 17 Vict., c. 51), and consists of a tax varying from 1½ to 11½ per cent. (according to the degree of consanguinity) levied on the beneficiary of real property passing by descent or otherwise on the death of another. The *estate duty* is a recent addition to the list of death duties, having been created in 1894 (57 and 58 Vict., c. 30). It is of a more general character than the earlier duties, being levied on all property, real or personal, "which, on the death of any person after August 1, 1894, or at a period ascertainable only by reference to such death, passes either immediately or after an interval, either certainly or contingently," to another. This tax is in some cases additional to other death duties, and in other cases in lieu thereof. Taken together, these several duties constitute a most comprehensive system, which is being imitated in many of its features in the United States. (See Inheritance Tax; Succession.) Consult: Hanson, *Death Duties; Encyclopædia of the Laws of England* (London, 1897), vol. i., 71; vol. iv., 120.

DEATH OF CÆSAR, The. A painting by Gérôme (1867), now in the possession of the Astor family. It represents Cæsar lying at the foot of Pompey's statue, surrounded by the conspirators, in the Senate House.

DEATH OF GENERAL WOLFE, The. A well-known painting by Sir Benjamin West (1771), now hanging in Grosvenor House, London. It represents the famous English commander dying in the arms of his soldiers, as the French colors are being brought to him.

DEATH OF MARLOWE, The. A tragedy by R. H. Horne (1837), and founded on the dramatic fate of the Elizabethan playwright.

DEATH-RATE. See Vital Statistics.

DEATH'S-HEAD MOTH (*Acherontia Atropos*). A species of hawk-moth (q.v.), widely distributed over the Old World. It measures almost five inches from tip to tip of the extended wings; is dark in color, the body yellow with black markings, the thorax with pale markings which have some resemblance to a skull, and from which it derives its name; the upper wings mottled with brown, black, and yellow. The caterpillar is greenish-yellow, the back speckled with black, with transverse lines partly blue and partly white; and feeds on the potato, tomato, and a variety of other plants. This insect is most frequently seen flying about in autumn, and only in the mornings and evenings. It is remarkable for emitting a plaintive squeaking sound, which, with its dark color, and the skull-like mark on the thorax, has led to its being regarded with superstitious dislike, the sudden appearance of large numbers being popularly held ominous of evil; while in Mauritius a notion prevails that it casts a dust from its wings which produces blindness in persons on whom it falls, and its entering an apartment is therefore regarded with dread. The sound is produced by the palpi, the inner faces of which are striated and are rubbed against the proboscis; and it is heard strongly and sharply when the insect is confined in the hand. The death's-head moth is interesting upon still another account, as one of those insects which enter and plunder beehives, feeding upon the honey.

DEATH'S JEST BOOK, or The Fool's Tragedy. A drama by T. L. Beddoes, published posthumously in 1850 and founded on the actual stabbing of a thirteenth-century duke by his jester.

DEATH VALLEY. A desert valley in Inyo County, Cal., lying between the Panamint Range on the west and the Funeral, Amargosa, and Grapevine ranges on the east (Map: California, H 6). The Panamint range rises to a maximum altitude of 10,937 feet in Telescope Peak, while the eastern ranges have altitudes of between 7000 and 8000 feet. Much of the valley is below sea-level, the lowest point being 480 feet below sea. The valley has a length, including the northwest arm, sometimes known as Mesquite Valley, of 135 miles. It varies greatly in breadth, being in few places less than 10 miles wide, and in some places having twice that breadth, while the distance from summit to summit of the bordering ranges is 20 to 30 miles. There are several places where ordinarily drinkable water can be obtained in the valley, among them Saratoga Springs in the southeastern part, Bennett Wells on the west side, and a point near the mouth of Furnace Creek at the north end of the Funeral range.

Several watercourses enter the valley, among them the Amargosa River from the south and Furnace Creek from the east, but it is only after heavy rains, which are of very rare occurrence, that they contain any water. The valley was formerly the bed of a salt lake, along the east side. There is a white salt deposit, with borax appearing in several places. In the western part a salt marsh still exists.

The salty bottom of the valley is destitute of vegetation, but on the west side is bordered by mesquite; the east and west slopes possess a sparse vegetation of cacti and desert shrubs and grasses. A growth of tall coarse grass is found in the salt marsh in the northern section. Animal life is confined to a few species of desert animals, chiefly reptilia, such as snakes, lizards, and horned toads; but flocks of blackbirds have been seen there. The meteorological conditions are very interesting, and during one summer the United States Weather Bureau instituted special observations here. The temperatures in the valley during the summer are excessive, a maximum of 122° F. in the shade having been observed on successive days. The air is very dry and dew never forms, the relative humidity averaging only about 23 per cent. During five summer months not quite an inch and a half of rainfall occurred, and on only nine days was the rainfall sufficient to permit its amount to be measured. The summer rains are of local character. It is probable that four or five inches of rainfall occur during the year. The prevailing wind is from the south in summer time; the average wind velocity for the season is about 10 miles per hour, which is high for that locality. Sand-storms and dust-whirlwinds occur with considerable frequency.

DEATHWATCH. Any of a family of small beetles, Ptinidæ, which live on dead animal and vegetable matter. They are usually of a cinnamon brown color, the trochanters are situated between the femora and the coxæ, and their larvæ are short, have six legs, no eyes, short antennæ, and require one or more years for development. Both the beetles and the larvæ do much damage to furniture, house-timbers, ships' stores, drugs, books, etc. A few, such as the often injurious apple-twig borer (*Amphicerus bicaudata*), bore into living, solid wood. Another form, of both Europe and America (*Lasioderma serricorne*), is a serious pest of capsicum and of dried tobacco. Still another species thrives on opium. The 'deathwatch' whose rapid ticking is so frequently heard in the quiet of the night is a species of world-wide distribution (*Sitodrepa panicea*), which not infrequently feeds on paper, paste, and leather bindings of books. The rapping is caused by a rapid hammering with the head on some suitable resounding material, and is probably a sexual call. It may sometimes be found doing this with remarkable force and agility on furniture where its action is observable. In England the name is sometimes applied to the book-lice of the family Psocidæ. See Bookworm.

DE AUGMENTIIS SCIENTIARUM, dē ag-mĕn'shĭ-ĭs sī'ĕn-shĭ-ā'rŭm (Lat., on the advancement of learning). A treatise by Francis Bacon. It forms the opening chapter of his *Instauratio Magna,* and is, after the *Novum Organum,* his most important treatise.

DÉBÂCLE, dā'bä'kl'. A French word, originally applied in that language to the breaking up of the ice in a harbor or river; but introduced into English by geologists to express any sudden flood of water, which bears before it opposing obstacles, and leaves its path marked with confused and scattered fragments of rocks and other débris.

La Débâcle is the title of an historical novel by Emile Zola, published in 1892, and describing the downfall of the Second Empire in 1870. By many this book is regarded as the most striking and powerful of all Zola's productions.

DE BARY, dā bä'rē, Heinrich Anton (1831-88). A German botanist. He was born at Frankfort-on-the-Main, and studied medicine and botany at Heidelberg, Marburg, and Berlin. After filling a professorship at Freiburg (1855-66) and Halle (1867-72), he was appointed rector of the newly established university at Strassburg. He was editor of the *Botanische Zeitung* from 1866 until his death. He published a number of standard works on fungi and kindred subjects, such as *Die Mycetozoen* (2d ed.

1864); *Beiträge zur Morphologie und Physiologie der Pilze* (5 parts, 1864-82, partly in collaboration with Woronin); *Vorlesungen über Bakterien* (2d ed. 1887).

DEBATABLE LAND. A tract of land situated between the Esk and the Sark, on the southwestern part of the border of England and Scotland, and at one time claimed by both kingdoms; hence its name. In 1542 commissioners appointed by the two Crowns divided the land by a line drawn from east to west betwixt the two rivers. The upper half was adjudged to Scotland, and the southern part to England. The Debatable Land continued long after to be the residence of freebooters and criminals, to whom its dubious state afforded a refuge. See Border.

DEBAT-PONSAN, d*e*-bȧ′ pôN′säN′, Edouard Bernard (1847—). A French historical and portrait painter, born in Toulouse. He was a pupil at the Beaux-Arts in Paris and then of Cabanel, and won the Prix de Rome in 1873. Although his pictures include historical subjects, such as the dramatic "Gate of the Louvre on Saint Bartholomew's Day" (1880), he is particularly successful with portraits. Among these are "M. Paul de Cassagnac" (1882) and "General Boulanger." His works are notable both for drawing and color. He received the Cross of the Legion of Honor in 1881. At Saint Louis (1904) he exhibited "Maize Flowers."

DEBAY, d*e*-bȧ′. A family of French sculptors. Jean Baptiste Joseph the elder (1779-1863) was born at Malines and studied under Chaudet in Paris, where he afterwards settled permanently. He was made an officer of the Legion of Honor in 1825. Among his principal works are the marble statues of "Charles Martel," in the Versailles Museum, and of "Colbert," in the Luxembourg, an "Equestrian Statue of Louis XIV." at Montpellier, two groups in marble of "Mercury and Argus," and "Girl in a Shell," which is generally pronounced his finest production. His son and pupil, Jean Baptiste Joseph the younger (1802-62), was born at Nantes, and studied also under Bosio in Paris, where he won the Grand Prix de Rome in 1829. For his marble statue of a "Young Girl Slave" (1836) he received a first-class medal. Besides the statues of "Charles VIII." in the Versailles Museum, and of "General Cambronne" at Nantes, a "Genius of the Navy" and a "Genius of the Chase" are worthy of notice. His brother, Auguste Hyacinthe (1804-65), born at Nantes, was equally excellent as a sculptor and painter. He was a pupil of his father, and, in painting, of Gros, in Paris, where he won the Grand Prix in 1823. His finest plastic work is "The First Cradle," which obtained a gold medal at the Universal Exposition of 1855. In the Louvre may be seen his statues of the architect Perrault, and of the painter Claude Lorrain. His most remarkable painting is the so-called "Field of the Cloth of Gold" in the Versailles Museum, an intensely dramatic composition on a gigantic scale, representing the meeting between Francis I. and Henry VIII. in 1520. An "Episode of 1793 at Nantes" and "Lucretia on the Collatine Hill" are in the Museum at Nantes.

DE BEAUMONT, d*e* bō̇′môN′. See Éon de Beaumont.

DE BEAUNE, d*e* bôn′, Florimond. See Beaune.

DEBEN′TURE (ME. *debentur*, from Lat. *debentur mihi*, there are owing to me, a phrase with which receipts began, from *debere*, owe). In the most general sense, a written acknowledgment of indebtedness. The term has long been in use in England to describe various classes of Government obligations, as soldiers' debentures, exchequer debentures, and custom-house debentures, and it is employed in the same sense in the United States (U. S. Rev. Stat., §§3037-3040). Of late years the term debenture has come into common use, especially in England, to designate company securities of all sorts, including the corporate bonds, which, in the United States, comprehend the greater part of such obligations. They need not be bonds, however, though they are usually of that character; and neither is it necessary, to give them the character of debentures, that they shall be issued by corporations, though most of them doubtless are. They may or may not be secured by mortgage or other charge on the property of the company or individual issuing them. They differ from certificates of stock, in that they contain a promise, usually in the form of a covenant, to pay a principal sum, with periodical interest thereon, on a specified date in the future, and they are usually issued in series, and for the purpose of borrowing money thereon. They are commonly transferable, and, it is said, may be so drawn as to be negotiable.

When, as usually is the case, debentures are secured by a charge on the property of the company issuing them, the charge is in the form of a 'floating security,' as it is called, attaching at any given moment during the life of the debenture to all the property owned by the company at that time. The dissolution of the company causes the debentures to mature, even though the time for which they were given has not expired, and the floating security thereupon becomes fixed and definite, and the property may be reached by the debenture-holders in an action for the appointment of a receiver and the enforcement of the security. From this it is evident that such debentures depend for their security upon the condition of the company, and may readily become worthless or nearly so.

The matter of issuing debentures and the nature of the security which they afford are largely regulated by general statutes providing for the incorporation of companies and sometimes by private acts for the government of individual corporations. Consult: Palmer, *Company Precedents* (8th ed., London, 1902); Manson, *The Debentures and Debenture Stock of Trading and Other Companies* (London, 1894); Jones, *Treatise on the Law of Corporate Bonds and Mortgages* (2d ed., Boston, 1894). See Bond; Corporation; Security.

DE′BIR. A place in the south of Judah (Josh. x. 38). (See Kirjath-Sepher.) In Josh. xv. 7, where Debir has been supposed to be a name of a city, we should probably read *Midbarah* 'to the wilderness,' and in Josh xiii. 26 the correct reading seems to be *Lidebir* or *Lodebar* (q.v.).

DEBIT AND CREDIT. See Soll und Haben.

DEB′ORAH (Heb. bee). A heroine who helped to deliver the Israelites from the oppression of the Canaanites, and who in tradition becomes a prophetess and a 'judge.' She was the wife of Lapidoth, and dwelt in the hill country of Ephraim (Judges iv. 4-5). For twenty years, the story goes, Israel had been oppressed by the Canaanites, when Deborah stirred up Barak, son of Abinoam of Kedesh in Napthali, and the two with an army went against Sisera, leader of the force of the Canaanite King Jabin, descended upon him from Mount Tabor, and routed his army (ib. iv. 10-16). Sisera himself, in flight, was slain while asleep by a woman, Jael, wife of Heber, the Kenite (ib. iv. 11-22). A forty years peace followed this success (ib. v. 31), though it should be added that the number forty is to be regarded as a general term for a generation. The so-called "Song of Deborah" (ib. v. 2-31) celebrates this victory, but there are some striking discrepancies between the song and the prose narrative in chap. iv. That the song is a contemporary record may be inferred from the archaic language and its general character. It is universally regarded by scholars as one of the oldest bits of literature in the Old Testament, but it makes no mention of Jabin, and commemorates the discomfiture of Sisera. Geographical discrepancies are also to be noted, and it would appear that the prose narrative, which is of course considerably later, refers to another event in which Jabin is chiefly involved, and that the two occurrences have been welded together by making Sisera the leader of Jabin's army. On the Song of Deborah, consult Cooke, *The History and Song of Deborah* (London, 1892). The text is obscure in some places and corrupt in others, but there is enough left to give this composition a unique position in the history of ancient poetry among the Semites.

DEBOUCHING, dē-bōōsh′ĭng (Fr. *déboucher,* from *de,* from + *boucher,* to stop up, from *bouche,* mouth, from Lat. *bucca,* cheek). In military usage, the issuing of troops from out a narrow passage, wood, defile, or any other roadway which has compelled them to advance in column or other narrow formation.

DE BOW, James Dunwoody Brownson (1820-67). An American journalist and statistician, born at Charleston, S. C. He began active life in business in Charleston, was admitted to the bar, and about the same time became editor of the *Southern Quarterly Review,* to which he contributed an article on the 'Oregon Question,' which attracted wide attention. In 1845 he left the *Southern Quarterly,* and established *De Bow's Commercial Review* in New Orleans (1846), which was at once successful and was for many years an organ of ultra-sectional opinion. In 1848 he became professor of political economy in the University of Louisiana, and in 1850 head of the State Census Bureau, which he managed with such distinction that he was appointed superintendent of the United States Census (1853-55). He continued to edit his review, and wrote much on statistics and finance, contributing numerous articles on American affairs to the eighth edition of the *Encyclopædia Britannica,* and fostering, by lectures and pen, the material and intellectual interests of the South, and later of the Confederacy. His review was suspended during the Civil War, but was resumed at its close, in New York and Nashville, De Bow having become a convert to the economy of free labor. He wrote *Industrial Resources of the Southern and Western States* (3 vols., 1853); and the greater part of *The Statistical View of the United States,* a compendium of the seventh census (1854); besides many statistical pamphlets.

DEBRECZEN, dĕ′brĕt-sĕn. A free imperial city of Hungary, capital of the County of Hajdu, situated on a sandy but fertile plain, about 137 miles east of Budapest by rail (Map: Hungary, G 3). The town, with its suburbs, occupies a large area; its old fortifications have been converted into promenades. It possesses a number of handsome modern buildings, among which are the Rathaus, theatre, and Protestant Church, from the pulpit of which, in 1849, Kossuth proclaimed the deposition of the Hapsburg dynasty. Among its numerous educational institutions is the famous Protestant college founded in 1531, with a library of 70,000 volumes. The manufactures for which the town is particularly famous are clay pipes, soap, and sausages. Its yearly cattle markets are of considerable importance. Population, in 1890, 57,000; in 1900, 72,351, mostly Hungarian Protestants. Debreczen suffered severely during the Turkish War in the sixteenth century, and in the seventeenth century, when it had become a Protestant town, was attacked by the Imperialists. In 1849 the Hungarian Diet and Government fled to Debreczen on the fall of Budapest. On July 3, 1849, it was taken by the Russians, and on August 3 it was the scene of a fierce battle between the Hungarians and the Russians.

DEBRY, de-brē′, or **DEBRIE′** Théodore (1528-98). A Flemish engraver, goldsmith, and printer, born at Liège. He settled at Frankfort-on-the-Main about 1580, where he worked as printer, engraver, and bookseller until his death. He executed a number of plates, which are of great value, but rather on account of the invention and originality displayed in them, than as works of art. His subjects are sometimes grotesque and fanciful, but more often processions or dances with numerous figures. Among his most celebrated plates are those for Boissard's *Roman Antiquities,* and 123 plates which he engraved for the *Collectiones Peregrinationum in Indiam Orientalem et Occidentalem* (1590). There were many editions of this work in different languages. An excellent collection is in the Lenox Library, New York City. He was also a medalist and designer for jewelry and plate. His sons, John Théodore (1561-1621) and John Israel (? - 1611), assisted him, and together they completed *The Antiquities.* John Théodore had less imagination than his father, but was the better artist.

DEBS, Eugene Victor (1855—). An American labor leader, born at Terre Haute, Ind. He was early a locomotive fireman, and later was connected with the wholesale grocery trade. In 1885 he sat in the Indiana Legislature. He was grand secretary and treasurer of the Brotherhood of Locomotive Firemen from 1880 to 1893, and president of the American Railway Union from 1893 to 1897, and during the latter incumbency managed the important strike of Western railways (1894), in the progress of which he was charged with the violation of an injunction, and imprisoned for six months for contempt of court. In 1900 he was the candidate of the Social Democratic Party, and in 1904, of the Socialist Party, for the Presidency of the United States.

DEBT (OF. *dette, debte,* Lat. *debitum,* that which is owed, from *debere,* to owe, from *de,* + *habere,* to have). In law, strictly speaking, a sum of money due upon a certain and expressed agreement. This obligation may be founded on simple contract, be contained in a sealed instrument, or be established by the judgment of a court. In this meaning a debt is a definite sum due, not merely a claim for damages. In some applications, however, the word has been much more broadly used, and it is probable that most courts would not confine it to the strict definition above given, unless required so to do by the context of a law or the special circumstances of the case. Thus, it has been held that a debt may be a certain sum of money promised to be paid in the future as well as a sum already actually due and payable; but if the sum be payable upon a contingency at a future time it cannot properly be called a debt. In its more general sense debt is that due from one person to another, whether money, goods, or service; under the United States legal-tender statutes the term embraces any obligation by contract, expressed or implied, which may be discharged by money through the voluntary action of the party bound; where a statute prohibits a city from increasing its indebtedness, it is held that for that city to give its corporate bonds for the future payment of valuable property would violate the prohibition; a bequest of 'whatever debts' might be due the testator at the time of his death has been held to include money deposited with his bankers; a tax is not of the nature of a debt, not being founded on contract, but being rather an impost laid by a government.

Under the dual form of government which obtains in this country, an important question in regard to debts was raised as to the provision of the United States Constitution forbidding the several States to pass laws impairing the validity of contracts. It was questioned whether an insolvency law adopted by a single State did not violate this provision, where it allowed a debt already existing to be canceled upon the debtor's complying with the regulations of the Insolvency Act. It has been settled by the courts that the States have the right to legislate in this manner, but subject to the power of the United States to enact a uniform law of bankruptcy (q.v.). Of course a State's insolvency law cannot impair the obligation of a contract existing before its passage. But in all contracts implying a debt entered into after its passage, it will be presumed that the parties to the contract have in mind the provisions of such law.

Historically, there has been a remarkable and interesting change in the way in which the law has dealt with the debtor and provided legal methods for the recovery of the debt. In ancient times the delinquent debtor was practically handed over to the tender mercies of his creditor; under the Mosaic law, in Greece and Rome, and in England under the Saxon rule, the debtor was made the actual slave of his creditor. A change followed under the feudal system, owing to the fact that the feudal idea required frequent military service, and imprisonment of the person for debt was not consistent with that theory. As the feudal system fell into disuse and the importance of trade and commerce increased, there was again a change toward the harsh treatment of the debtor, and it is only within our own time that imprisonment for debt has been generally abolished. The present tendency of legislation is to afford an easy and simple procedure, so that undisputed debts may be adjudicated upon quickly, and as summarily as is consistent with the right of defense and of appeal. The action of debt or the simple substitutes therefor provided by the reformed procedure in England and this country, is a civil suit, whose worst result is a money judgment and an execution levied on the property of the debtor for its satisfaction. Where the element of fraud, false pretenses, or concealment of property enters into the question, the courts still possess, both in England and the United States, power to restrain and under some conditions even to imprison the debtor. For a fuller exposition of these principles and of other matters relating to phases of the general subject, see ABSCONDING; ATTACHMENT; BANKRUPTCY; CESSIO BONORUM; CREDITOR; DEBTOR; GARNISHMENT; IMPRISONMENT; INSOLVENCY; SEQUESTRATION; TRUSTEE PROCESS. Consult the authorities referred to under the titles treating of specific subjects, such as CONTRACT; BOND; ATTACHMENT; BANKRUPTCY, etc., and also the *Encyclopædia of English Law;* Bell, *Commentaries on the Statutes Relative to Diligence, or Execution Against the Movable Estate; Imprisonment,* etc. (Edinburgh, 1890). where a history of imprisonment for debt will be found; the general treatises such as the Commentaries of Kent, Blackstone, Stephen, Bell, Erskine, etc., referred to under LAW.

DEBT, ACTION OF. One of the old forms of personal actions in common-law pleading, being used, under that system, to recover a sum certain, or capable of being ascertained by computation only. Formerly the declaration alleged the *debet et detinet,* on the theory that the defendant owed the money and was guilty of an unjust detention of the goods or whatever happened to be the consideration, but this fell into disuse and is no longer proper. Where the obligation is founded on a simple contract the declaration must allege the consideration, and if on a specialty or on a record it must be set out in full. It differs from assumpsit (q.v.), where a special promise is necessary. It is still retained in some of the United States where common-law pleading is used, but has been abolished by statute in England, where it originated. See COMMON COUNTS; COMMON FORMS; FORMS OF ACTION; also PLEADING, and consult the authorities there referred to.

DEBT, PUBLIC. National debt has become a marked feature in the finances of modern States. In any strict sense the public debt designates all of the outstanding obligations of the government. These are of many kinds. Among them, for instance. in those States which conduct government savings banks must be included the sums due depositors. In countries which, like France, require the collectors of taxes to make payments at specified times, advancing if need be from their own resources the amount required, such advances must for the time being be regarded as part of the national debt. But it is not with these informal obligations, which correspond somewhat with the book debts of merchants, that the phrase 'public debt' is generally concerned. It refers rather to the more formal obligations undertaken by governments and represented by formal instruments of indebtedness.

This formal debt may be divided into short-term and long-term obligations. To the former is frequently applied the expression 'floating debt,' and the analogy which this suggests with the transactions of corporations indicates the general nature of such indebtedness. These short-term obligations are normally used to anticipate revenues, and resemble the promissory notes issued by merchants in the course of their business transactions. As the latter frequently have a certain aggregate of outstanding notes, though individual notes be promptly paid when due, so the floating debt of the State may readily become a permanent feature in its finances by the creation of new debts running parallel to the payment of the old. When such debts become too numerous, and the obligation of repayment a source of embarrassment, it is not infrequent for them to be converted into funded or permanent debt.

The funded debt consists in obligations which mature at a more or less distant date, or which are payable at the option of the Government. Bonds maturing within a fixed period are familiar in American finance—e.g. the so-called ten-forties of the act of March 3, 1863. But more commonly no time is set for the ultimate redemption of public obligations. In the national finance of European States it is usually understood that the Government will not soon avail itself of the privilege of repayment. So much is this the case that on the Continent of Europe the debts are spoken of as *rentes*, the emphasis being thereby wholly laid upon the fact that the payment of interest alone is expected, while in England the greater part of the public debt is regarded as a series of perpetual annuities. A further form of public debt consists in irredeemable paper money. In essence it is a debt without interest, payable at the option of the Government. See MONEY.

The public debt, in the sense in which it is known to-day, is essentially a creation of modern times. Emergencies in the mediæval State were met by enforced contributions from the people, and in part by contraction of debt by the monarch. But the debt so contracted was a debt of the crown, and not of the State, and rested upon the personal credit of the ruler. With the growth of parliamentary power and the control of supplies by representatives of the people, State debts appeared. They were originally confined to States like Holland and England, where loanable capital was plentiful, and where the commercial classes were sufficiently influential with the Government to insure against repudiation. Later they were extended even to States under despotic and irresponsible rule. In the beginning public debts frequently assumed the form of life annuities; but as these varied of necessity with the age of the persons who advanced money to the State, the complications of accounting were excessive; moreover, the amount of the advances which could be obtained in this way was necessarily limited. It was a simplification to issue so-called perpetual annuities with a definite annual payment, and the computation of life annuities gave way to the simple operations of interest. In Great Britain terminable annuities are still common; but they form a comparatively insignificant proportion of the total indebtedness of the Government. The term public debt usually refers to the national debt alone. In its widest sense, however, it includes local indebtedness also. It is only within the past century that the municipalities have become debtors to any considerable extent; but at present the aggregate of municipal debts in the United States rivals the national debt in magnitude. See FINANCE.

CAUSES OF DEBT. Public debt arises under three distinct sets of circumstances: (1) War expenditure. A modern war demands the expenditure of an enormous sum of money, and this sum is usually raised through loans. Debts of this class are naturally borne by the national Government. (2) Public works. The increase in commercial intercourse and the rise in standards of national and civic life have required a great development of public improvements. The cost of these has been met partly by taxation, partly by the raising of loans. The debts incurred are borne sometimes by the national Government, sometimes by the localities. Practice differs in the various States—a fact which must be taken into account in comparing the national debts of different countries. (3) The funding of floating indebtedness. The presence of a large volume of demand obligations embarrasses the workings of the treasury and impairs the credit of a government. When it is not convenient to pay them out of revenue, it is customary to change them into funded debt.

THEORY OF PUBLIC DEBTS. In the eighteenth century it was held by many writers on finance that a public debt increased a nation's wealth. Public bonds were regarded as a net addition to capital. The claim was also advanced that a public debt was a matter of indifference to the State, since it merely represented money owed by one set of citizens to another. Adam Smith and his followers, on the other hand, were inclined to regard public debt as an unqualified evil. Modern opinion recognizes that the debts of a State, like those of an individual, are necessary or unnecessary, wise or foolish, according to the circumstances under which they are contracted. The expenses of a State are incapable of sudden contraction; its revenues, however, fluctuate to a considerable extent. Unless a large surplus is put by in favorable times, a deficit is inevitable at times when revenues fall off. Since the accumulation of a surplus seriously disturbs commerce and industry, the creation of floating indebtedness is frequently expedient. In time of war, when the honor and possibly the very existence of a nation is at stake, it is imperative that immense sums of money should be raised to meet the expenditures attendant upon mobilizing and equipping armies, building fleets, and preparing defenses. At such a time the ordinary sources of revenue fail; taxation sufficient to cover the abnormal expenditures would amount to a virtual confiscation of property, and would so derange industry as to impair the capacity of a State to withstand a long-continued struggle. The raising of a loan shifts the burden to a period when industry will be better prepared to endure it. In the peaceful competition for commercial ascendency, great advantages are gained by those States or communities which are first to develop their resources. It is, therefore, often expedient to undertake public improvements which would be too costly to be paid for out of increased taxation. Such improvements, moreover, create new sources of revenue, and therefore may impose merely a nominal burden upon posterity. Certain classes of public works—e.g. State railways and telegraphs—yield a direct revenue which may be sufficient to cover depreciation and interest on the capital invested in them. It would be manifestly unreasonable to pay for such works out of taxation. To do so would unjustly burden the present taxpayer for the advantage of future generations.

While there are circumstances, then, under which the creation of public debt is abundantly justified, it remains true that in practice, debts are often contracted to national detriment. The ease with which money is raised by loans leads often to reckless financiering. Useless wars are undertaken, premature and unproductive public works are entered upon. The expediency of particular loans, however, is a matter to be decided by practical politics, not by financial theory.

The effect upon industry of the creation of a public debt has received thorough discussion from economists. When the Government enters the market as a bidder for money, capital is drawn away from productive enterprises, and industry is in so far hampered. It may, however, happen that the demand for more capital will encourage saving, so that the loss to industry will not be measured by the whole extent of the public loan. If the loan is for productive purposes which would otherwise be undertaken by private enterprise, industry is not necessarily deranged. It makes some difference whether the loan is made at home or abroad. Owing to friction in the international flow of capital, a foreign loan may have far less effect upon national industry than a domestic loan.

Important political consequences frequently result from the creation of a public debt. When the creditors of a State are its own citizens, a party vitally interested in the stability of the government is created. When a weak State incurs a large debt to foreigners, it may endanger its own autonomy. Egypt is a classical example of a State which has fallen under foreign control in this way.

CONVERSION OR REFUNDING OF PUBLIC DEBT. Public debts are frequently created at a time of low national credit. To attract investors, it is necessary to issue bonds paying a high rate of interest. When national credit improves, it is possible to exchange high-interest obligations which are payable at the option of the Government for others bearing a lower rate of interest. The exchange may be a direct one, in which case the Government retains its former creditors; or a new loan may be issued to pay off the old obligations.

Almost every country which has a public debt has refunded it at various times. The refunding operations of the British Treasury extend through two centuries. Conversion has been frequent in the United States, in both national and local finance.

The investor in public funds is naturally opposed to conversion. Part of the inducement for investing in bonds consists in the expectation that they will continue to bear a high rate of interest, and so rise above par value after normal conditions return. In the United States the investor is usually insured against early conversion by the provisions of the loan; in other countries the same end is reached by the adoption of a settled policy of converting only after a considerable lapse of time. One method of insuring the investor against conversion is to issue low-interest bonds below par. Redemption of such obligations entails a heavy cost. This practice is generally regarded, however, as bad finance, and is not resorted to in the United States.

REPAYMENT OF PUBLIC DEBT. Some parts of the public debt are so constituted as to be automatically extinguished. Such are the terminable annuities of British finance. Each payment includes, besides interest, a partial repayment of the principal. It would obviously be inconvenient to pay a large part of the public debt in this way, since payments would have to be made whether revenues were plentiful or not. Most frequently debt is paid by redeeming obligations which are due, or which are payable at the option of Government, or by purchasing bonds in the open market and canceling them.

The policy of repaying public debts has often been called into question. In order to redeem a debt, a greater sum must be taken from the people by taxation; and it is the last portion of the taxes which is hardest to collect and which causes the greatest distress. Almost all modern States are growing in wealth and population; consequently, it is to be expected that a debt which at present would be very difficult to pay will in the future be relatively insignificant. So long as gold was depreciating in value, the burden of debt was automatically growing less; and the application of science to mining and economy in the use of gold may bring about another period of declining value of gold which would again reduce the burden of public debt without resort to taxation.

When a State is insufficiently provided with capital, its bonds are likely to be held by foreign capitalists. In repaying the debt, the State may diminish the scanty supply of capital and so injure its own industries.

There are, however, cogent reasons for the redemption of public debts. A future generation may indeed be more able to pay a given sum than the present generation; but the future will doubtless have correspondingly heavy obligations of its own. Gold may indeed depreciate, but it may also appreciate. The payment of debt may derange industry, but it unquestionably strengthens the credit of a nation and places it in a condition to meet emergencies. On these grounds the weight of modern authority favors the gradual redemption of public debts.

DEBTS OF LEADING NATIONS. The national debt of England is dated generally from the year 1693, with the loan to the Government of the entire capital of the Bank of England, amounting to £1,200,000. In return for this loan the Bank received its charter and privileges. The needs of the Government were pressing, and the debt, once started, grew rapidly, as the result of the vigorous foreign policy of William III. At the accession of the House of Hanover, in 1714, it had reached £50,000,000, and it grew throughout the following century, as a result of the several wars in which England found herself engaged. When, in 1793, the great struggle with France began, the debt was £260,000,000, and when it terminated with the Treaty of Vienna, in 1815, it had reached the sum of £885,000,000. The example set by England was followed by the other European countries, although before the closing years of the eighteenth century few of the States had contracted debts upon any considerable scale. The Napoleonic struggle, which involved all Europe, inaugurated an era of debt for modern States, and the Nineteenth Century witnessed a rapid growth of national indebtedness. The following table compiled from the reports of the Bureau of Statistics of the Department of Commerce and Labor gives the indebtedness of some of the principal nations, and of all the nations of the world combined, since 1800. The table shows that the progress of debt in most countries has been constantly forward, and that, with the exception of the United Kingdom and the United States, there has been no conspicuous reduction of the debt. The debt of the United Kingdom reached its maximum in 1857, when it amounted to £839,000,000. In 1904 the total debt of the United Kingdom was $762,000,000. The process of debt reduction was retarded by the expenditures occasioned by the Boer War and by municipal borrowings.

DEBTS OF PRINCIPAL NATIONS, AND AGGREGATE FOR ALL NATIONS OF THE WORLD AT VARIOUS DATES FROM 1800 to 1900

DATES	Austria	Belgium	France	Germany[1]	Italy
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
1800......	[3]170,327,500	....	....	25,549,125	....
1820......	480,323,550	....	[6]689,923,705	150,861,500	....
1850......	[9]608,312,500	....	[10]1,192,292,500	....	[11]194,660,000
1870......	[16]1,464,816,500	[17]133,147,440	2,676,575,000	[18]115,948,000	[17]1,386,952,500
1880......	....	[21]246,994,341	[22]4,065,946,151	....	[22]2,218,861,209
1900	[29]1,697,255,140	[30]504,460,000	5,800,691,814	557,626,622	2,583,983,780
1905	[31]1,107,464,025	[32]544,052,979	[31]5,856,706,403	[32]698,849,400	[32]2,560,605,000

DATES	Netherlands	Russia	United Kingdom	United States	World
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*
1800......	[2]486,650,000	....	[4]2,616,488,363	82,976,294	[5]2,433,250,000
1820......	[7]700,776,000	....	[8]4,381,975,906	91,015,566	7,299,750,000
1850......	[12]498,621,590	[14]608,312,500	[15]4,082,596,603	63,452,774	[9]8,419,045,000
1870......	[17]392,434,560	[17]1,459,950,000	3,896,606,550	[19]2,331,169,956	[20]22,410,232,000
1880......	[21]390,823,749	[24]2,238,872,257	3,778,858,366	[19]1,919,326,748	[25]26,249,901,000
1900 ...	466,419,294	3,167,320,000	3,060,926,304	[19]1,107,711,257	31,201,759,000
1905 ...	[31]463,150,904	[31]3,414,061,734	[31]3,885,166,333	989,866,772	43,698,029,541

[1] Prussia prior to 1870; figures for 1889 and 1900 are exclusive of State debts, which in 1899–1900 amounted to $2,015,958,000. [2] 1789. [3] 1810. [4] 1802. [5] 1793. [6] 1830. [7] 1814. [8] 1815. [9] 1848. [10] 1852. [11] 1847 (figures for Sardinia). [12] 1851. [13] 1854. [14] 1853. [15] 1857. [16] 1868. [17] 1869. [18] Chiefly former debt of North German Confederation. [19] Total debt less cash in the Treasury. [20] 1872. [21] 1879. [22] 1883. [23] 1885. [24] 1876. [25] 1882. [26] 1888. [27] 1889. [28] 1894. [29] 1898. [30] 1899. [31] 1903. [32] 1902.

AMERICAN NATIONAL DEBT. The public debt of the United States was first reported, 1791, two years after the organization of the Government, as $75,463,476.52. In 1812, at the commencement of the second war with England, it had fallen to $45,209,737.90. That war brought it up to a total of $127,334,933.74. After peace the reduction was from $3,000,000 to $10,000,000 per year until in 1836 it reached its lowest point, being only $37,515.05. Thenceforward it increased one year and decreased the next, until in 1860—the year before the Civil War—it was $64,842,287.88, and the annual interest was $3,443,687. This was a rate per capita on the whole population of $1.91 debt and 11 cents interest. The outbreak of the Civil War made the raising of enormous sums of money an imperative necessity. Two small loans had been made just before—in 1858, $20,000,000 in 5 per cents., and in 1860, $21,000,000 in 6 per cents.—the first to run 15 and the last 20 years. Of the last loan, only $7,022,000 was issued. Of the loans made necessary by the Civil War, the first was February 8, 1861, $25,000,000 at 6 per cent., to run 20 years, of which $18,415,000 was reissued. March 2, 1861, 6 per cent. Treasury notes were authorized and $35,364,450 issued. Same date, $1,095,850 reissued to pay the Oregon war debt. July 17, 1861, $250,000,000, at 7 per cent., to run 20 years, with authority to issue any part in the form of Treasury notes running three years at $7\frac{3}{10}$ per cent. interest, or on notes not bearing interest, but payable on demand, or in Treasury certificates for one year bearing $3\frac{65}{100}$ per cent. interest; the whole amount of demand notes not to exceed $50,000,000. An act of August 5, 1861, authorized the issue of 6 per cent. bonds, running 20 years, to exchange for the one and three year notes just mentioned, with accumulated interest, at any time before their maturity; and the demand notes were made receivable for all dues to the Government. Before the close of the year the demand notes, at first rejected by the banks, were at a premium, and the interest-bearing notes were readily convertible into permanent 6 per-cent bonds. On February 12, 1862, $10,000,000 more of demand notes were issued. In the same month a great war loan was authorized—$500,000,000 of 6 per cent. bonds, redeemable after 5 and payable after 20 years. The loan was readily taken, and the full amount was issued. In 1864-65, $15,000,000 more was authorized of the same loan. In February, 1862, $150,000,000 of legal-tender notes were authorized, of which $50,000,000 were to take the place of demand notes. In July, 1862, $150,000,000 more were authorized, and an equal amount in addition in March, 1863, making $450,000,000 in all. These issues formed the currency known as 'greenbacks,' from the color of the paper. An act in February, 1862, authorized the acceptance of $25,000,000 of deposits, increased in March to $100,000,000, on which 5 per cent. interest was paid. In June, 1864, $50,000,000 more was authorized at 6 per cent. This was a temporary loan, to be repaid on ten days' notice, and was all redeemed before the close of 1866. In March, 1862, Congress authorized the issue of certificates of indebtedness to public creditors in the adjustment of claims, running 1 year at 6 per cent. There were $561,753,241 issued, all redeemed before 1866. In July, 1862, postage stamps were issued for currency, and made a legal tender for sums less than $5. In March, 1863, fractional currency was authorized in place of postage stamps, the amount limited to $50,000,000. In March, 1863, a loan of $900,000,000 was authorized, principal and interest payable in coin; but only $75,000,000 was issued. The same act authorized $400,000,000, in one, two, and three year Treasury notes, interest not over 6 per cent., payable in ordinary money, and to be a legal tender for their face value. The actual issues were: Of one-year notes, at 5 per cent., $44,520,000; two-year notes, at 5 per cent., $166,480,000; three-year notes, at 6 per cent., $266,595,440; making the whole issue $477,595,400; all canceled or exchanged before May 15, 1868. In March, 1864, a loan of $200,000,000 was authorized at 5 or 6 per cent., principal and interest payable in coin; $196,117,300 were issued at 5 per cent., to run 40 years (the 10-40s of 1864); and $3,882,500 at 6 per cent. Most of the 5 per cents. brought premiums from 1 to 7 per cent. In June, 1864, a loan of $400,000,000 was authorized at 6 per cent. (the 5-20s of 1864), of which $121,561,300 was issued. In June, 1864, Congress authorized the issue of $200,000,000 in 7-30 Treasury notes, and in March, 1865, the sum was increased by $600,000,000 more. The whole issue was $829,992,500 of 7-30 interest-bearing notes, and the whole loan was redeemed by the middle of July, 1868. In March, 1865, a loan was authorized of $600,000,000 in 6 per cent. 5-20 bonds, to be used only for the payment of Treasury notes or other obligations of the nation. Two issues were made: July 1, $322,988,950 and $379,616,050, and in July, 1868, $42,539,350, all to redeem Treasury notes and other obligations; but in no case to increase the public debt. In March, 1867, and July, 1868, there were issued $85,150,000 of temporary loan certificates of deposit, bearing interest at 3 per cent., to redeem compound-interest notes. In July, 1870, the great refunding act was passed. The Secretary of the Treasury was authorized to issue $200,000,000 at 5 per cent., $300,000,000 at 4½ per cent., and $1,000,000,000 at 4 per cent. of thirty-year bonds, principal and interest payable in coin, to be used only to redeem the 6 per cent. or other early bonds. Besides these issues, there were guarantee bonds issued to the Pacific and other railroads, secured by mortgage on the roads. In January, 1871, the 5 per cent. bonds were increased to $500,000,000.

These enormous financial transactions have no parallel for extent in the world's history. Yet for a time there was much fear that such loans could not be floated; but when they were proved possible without recourse to the capitalists of foreign countries, the loyal people of the Union had abundant cause for congratulation. The loan of 1862 ($515,000,000) was the greatest in amount and the most successful thus far attempted. Afterwards, however, loans were not easily made, and the Government was compelled to resort to currency and Treasury notes, and also compound-interest notes and certificates of indebtedness. The greatest test of the financial strength of the nation fiercely struggling to maintain its political existence was in 1864. On July 11, in that year, gold touched its highest point, $2.85, and a paper dollar was worth in gold only about 38 cents.

From the period of the Civil War the surplus of revenue was applied to the public debt. As the bonds bearing the higher rates of interest were first extinguished, the interest burden diminished even more rapidly than the principal. Thus, while in 1865 the total interest-bearing debt amounted to $2,381,000,000, and the annual interest charge to $151,000,000, at its lowest point, in 1892, of $585,000,000 principal, the interest charge was, in round numbers, but $23,000,000. As the population had increased rapidly during the interval, the interest per capita had declined from $4.39 to 39 cents. After 1893 the amount of public debt was increased by the issue of bonds for the purpose of securing the Treasury against the drain upon its gold reserve. This issue of 5 per cent. bonds was followed in 1898 by a further issue of 3 per cent. bonds for the purpose of meeting the expenses of the Spanish War. By the act of March 14, 1900, the 3, 4, and 5 per cent. bonds were made convertible into 2 per cent. bonds, which resulted in a considerable diminution of the annual interest charge. The interest-bearing debt of the United States on October 1, 1905, was made up of the following:

2%	Bonds	$580,429,000
3%	“	68,789,060
4%	“	245,940,880
	Total	$895,158,940

The annual interest charge upon this debt is $23,609,886. The following is a statement of outstanding principal of the public debt of the United States on January 1 of each year from 1791 to 1842 inclusive, and on July 1 of each year from 1843 to 1905 inclusive:

1791,	Jan. 1	$75,463,476.52
1792	“	77,227,924.66
1793	“	80,358,634.04
1794	“	78,427,404.77
1795	“	80,747,587.39
1796	“	83,762,172.07
1797	“	82,064,479.33
1798	“	79,228,529.12
1799	“	78,408,669.77
1800	“	82,976,294.35
1801	“	83,038,050.80
1802	“	80,712,632.25
1803	“	77,054,686.40
1804	“	86,427,120.88
1805	“	82,312,150.50
1806	“	75,723,270.66
1807	“	69,218,398.64
1808	“	65,196,317.97
1809	“	57,023,192.09
1810	“	53,173,217.52
1811	“	48,005,587.76
1812	“	45,209,737.90
1813	“	55,962,827.57
1814	“	81,487,846.24
1815	“	99,833,660.15
1816	“	127,334,933.74
1817	“	123,491,965.16
1818	“	103,466,633.83
1819	“	95,529,648.28
1820	“	91,015,566.15
1821	“	89,987,427.66
1822	“	93,546,676.98
1823	“	90,875,877.28
1824	“	90,269,777.77
1825	“	83,788,432.71
1826	“	81,054,059.99
1827	“	73,987,357.20
1828	“	67,475,043.87
1829	“	58,421,413.67
1830	“	48,565,406.50
1831	“	39,123,191.68
1832	“	24,322,235.18
1833	“	7,001,698.83
1834	“	4,760,082.08
1835	“	33,733.05
1836	“	37,513.05
1837	“	336,957.83
1838	“	3,308,124.07
1839	“	10,434,221.14
1840	“	3,573,343.82
1841	“	5,250,875.54
1842	“	13,594,480.73
1843,	July 1	32,742,922.00
1844	“	23,461,652.50
1845	“	15,925,303.01
1846	“	15,550,202.97
1847	“	38,826,534.77
1848	“	47,044,862.23
1849	“	63,061,858.69
1850	“	63,452,773.55
1851	“	68,304,796.02
1852	“	66,199,341.71
1853	“	59,803,117.70
1854	“	42,242,222.42
1855	“	35,586,956.56
1856	“	31,932,537.90
1857	“	28,699,831.85
1858	“	44,911,881.03
1859	“	58,496,837.88
1860	“	64,842,287.88
1861	“	90,580,873.72
1862	“	524,176,412.13
1863	“	1,119,772,138.63
1864	“	1,815,784,370.57
1865	“	2,680,647,869.74
1866	“	2,773,236,173.69
1867	“	2,678,126,103 87

1868,	July 1	$2,611,687,851.19
1869	“	2,588,452,213.94
1870	“	2,480,672,427.81
1871	“	2,353,211,332.32
1872	“	2,253,251,328.78
1873	“	2,234,482,993.20
1874	“	2,251,690,468.43
1875	“	2,232,284,531.96
1876	“	2,180,395,067.15
1877	“	2,205,301,392.10
1878	“	2,256,205,892 53
1879	“	2,349,567,482.04
1880	“	2,120,415,370.63
1881	“	2,069,013,569.58
1882	“	1,918,312,994.03
1883	“	1,884,171,728.07
1884	“	1,830,528,923.57
1885	“	1,863,964,873.14
1886	“	1,775,063,013.78
1887	“	1,657,602,592.63
1888	“	1,692,858,984.58
1889	“	1,619,052,922.23
1890	“	1,552,140,204.73
1891	“	1,545,996,591.61
1892	“	1,588,464,144.63
1893	“	1,545,985,686.13
1894	“	1,632,253,636.68
1895	“	1,676,120,983.25
1896	“	1,769,840,323.40
1897	“	1,817,672,665.90
1898	“	1,796,531,995.90
1899	“	1,991,927,306.92
1900	“	2,136,961,091.67
1901	“	2,143,326,933.89
1902	“	2,158,610,445.89
1903	“	2,202,464,781.89
1904	“	2,264,003,585.14
1905	“	2,274,615,063.84

Consult: Adams, *Public Debts* (New York, 1890); Bastable, *Public Finance* (London, 1895); Fenn, *The Public Funds* (London, 1898); *Statistical Abstract of the United States* (annual, Washington); *Statesman's Year Book* (annual, London). See Finance; Bank, Banking; Annuities; Refunding; Money.

DEBTOR. In the history of this, as of almost every other branch of law, we may, if we will, trace the march of social progress in general. In primitive society the arrangements for borrowing and lending are rarely such as to enable the citizens to avail themselves with security of their mutual resources, or to assign such limits to the powers of the creditor as either the claims of humanity or his own true interests demand. On the one hand, lending is confounded with almsgiving, and the exaction of interest, and even of capital, is regarded as an act of inhumanity toward the poor. On the other hand, no sooner do the creditor's rights come to be recognized in anything like a legal sense than there seem to be no logical grounds on which any limits can be set to them. If he is entitled to exact the debt at all, he is entitled to seize the goods of the debtor; and if the debtor has no goods, he is entitled to his services, which also implies the possession of his person and, further, the possession of his life. Moreover, from the exaggerated notions of the domestic ties which usually prevail in early times, the person of the individual, where he is the father of a family, brings with it his wife, his children, and his slaves. The creditor thus becomes the master of the life and liberty of his debtor, and of all those who are dependent upon him. The arrangements of the Mosaic law are an illustration of the manner in which, in the ruder forms of society, the laws of debt combine a degree of lenity with a degree of severity which are equally alien to modern views. In this as in many other respects they are typical of the state of society to which they belong, rather than a system peculiar to the Jews. If an Israelite became poor, it was a duty to lend to him, and no interest was to be exacted either in money or in produce. If he was a foreigner, the case was different, and the taking of interest was legal (Ex. xxii. 25; Deut. xxiii. 19, 20; Lev. xxv. 35-38). When the Sabbatical year arrived—i.e. at the end of every seven years—there was a general remission of debts as between Israelite and Israelite; and the near approach of the year of remission was not to be recognized as an apology for declining to lend to an indigent brother (Deut. xv. 1-11). Pledges, it is true, might be taken, but even here the same humane principles prevailed. The upper millstone was sacred, for to take it would be to deprive the debtor of the means of subsistence. If raiment was the pledge, it must be returned before nightfall, when it might be required for a covering; and the widow's garment could not be taken in pledge (Ex. xxii. 26, 27). In strange contrast to this is the provision (Lev. xxv. 39) that a poor Israelite may be sold to one possessed of substance, even when modified by the special provision that he shall serve as a hired servant, not as a bond servant, and shall be set at liberty when the year of jubilee arrives. Children were often given in pledge (Job xxiv. 9), and ultimately into slavery, in payment of debt (II. Kings iv. 1). In Matthew xviii. Christ refers to the custom of selling the debtor, his wife and children, and all that he had, in payment, rather as a general custom of all nations than as one peculiar to the Jews—the 'certain king' being a typical instance of a man of substance.

Both in Greece and in Rome the creditor had a claim to the person of the debtor. Previous to the time of Solon this arrangement had produced consequences at Athens closely analogous to those which afterwards led to the struggles between the patricians and plebeians at Rome; and his abolition of it forms one of Solon's many claims to the character of an enlightened legislator. By the Twelve Tables it was enacted at Rome that if the debtor admitted the debt, or had had judgment pronounced against him for it, thirty days should be allowed him for payment. At the expiration of that period he was liable to be given into the hands of his creditor, who kept him sixty days in chains, exposing him from time to time publicly, and proclaiming his debt. If no one stepped in to release him, the debtor, at the end of that time, might be sold for a slave, or put to death. If there were several creditors, the letter of the law permitted them to cut their debtor in pieces, sharing him in proportion to their claims; but Gellius tells us that no Shylock ever was found in Rome. To treat him as a slave, however, and make him work out the debt, was the common practice; and the children in his power, in accordance with the whole constitution of society at Rome, followed his condition. The Lex Pœtelia (B.C. 326) alleviated the condition of the debtors (*nexi*) to the extent, at least, of preventing summary imprisonment, and relieving all debtors for the future from being put in chains. There do not seem to have been any public prisons for debtors at Rome, and each creditor, consequently, was the jailer of his own debtor. In this circumstance we probably see the reason of the prominence which was given by the plebeians to a change in the laws of debtor and creditor, on the occasion of their first secession, in B.C. 494, and subsequently during the whole course of the struggles between the two orders.

During the feudal period the person in general was not attachable for debt, imprisonment being inconsistent with the duties of warlike service, to which every man was bound; and it was for the encouragement of commerce and in consideration of the merchant having to deal with strangers and foreigners that it was first introduced by the mercantile communities of Europe. By the Statute of Merchants it was enacted by the English Parliament, in 1282, that in lending money a merchant might bring the borrower before the Lord Mayor of London, or the chief warden of another good town, and cause him to acknowledge his debt and day of payment. A recognizance (q.v.) was then enrolled, and an obligation written by the clerk and sealed with the King's seal and the debtor's. Failing payment, the creditor was entitled to produce this obligation, and to demand a warrant to seize the person of his debtor and to commit him to the Tower. This barbarous practice of punishing misfortune as a crime flourished in England for six hundred years, until the humanitarian sentiment of our own time, stirred into action by the efforts of Samuel Romilly and other reformers, forced the abandonment of the practice. An impression of the extent of the hardship which it involved may be gained from the statistics. Parliamentary returns show that in the eighteen months subsequent to the commercial panic of 1825, 101,000 writs for debt were issued from the English courts. In the year ending January 5, 1830, there were 7114 debtors sent to prison in London, and on that day 1545 of these were still in confinement. In general it may be said that, up to the time of the reform legislation referred to, the prisons of England were crowded with debtors. The first statute affording partial relief to these unfortunates was passed in 1838, but it was not until 1868 that the system was abolished (Statutes 32 and 33 Vict., c. 62).

The practice of imprisonment for debt has also prevailed, though to a much more limited extent, in the United States. It was abolished in New York in 1831, and shortly after that date by the other States in which it had been permitted. In many of the States it has never been recognized. Both in England and the United States, however, a limited right of coercing a dishonest debtor by arrest in civil process is permitted by statute. It is generally allowed in actions for injury to the person or character, or for injury to or the wrongful taking of property; embezzlement by public officers or persons acting in a private fiduciary capacity as trustees; for misconduct in office, or in any professional employment; in actions to recover possession of personal property, where it is concealed or kept out of the reach of the sheriff; and where the defendant has been guilty of fraud in contracting the debt or in avoiding payment. Women are generally exempt from arrest in all cases except actions for willful injury to person, character, or property.

As to the manner in which the position of the debtor has been mitigated by the general adoption of the principle of the bankruptcy and insolvency laws, see those titles. See also DEBT, and the titles there referred to. For the remedies available against absconding debtors, see ABSCONDING.

DÉBUT, dā'bų' (Fr.). A word which signifies generally a 'beginning' or 'entrance,' but especially applied to the first appearance of an actor or actress on the stage, or to a first appearance in a particular theatre. In these circumstances the actor is called a *débutant*; the actress, a *débutante*.

DECA (Gk. *δέκα*, *deka*, ten). A common prefix or combining form meaning *ten*, as in *decapolis*, a union of ten cities; *decalogue*, the Ten Commandments; *décamètre*, a measure of ten meters, etc. From *deca* is formed:

DECADE, a collection or group of ten. In its most common application it signifies a period of ten years. The word was used in the calendar of the French Republic to designate the week of ten days. Each month of thirty days was divided into three decades. The days of each decade were named *primidi, duodi, tridi, quartidi, quintidi, sextidi, septidi, octidi, nonidi*, and *decadi*. The tenth, or *decadi*, was the day of rest, and, as the Republic acknowledged no definite religion, was devoted to the practice of and exhortation to virtue. The Republican year numbered 36 decades. The remaining five (in leap-years, six) days were set apart as holidays at the end of the year without being numbered.

DEC'ACHORD (Gk. *δεκάχορδος*, *dekachordos*, ten-stringed, from *δέκα*, *deka*, Lat. *decem*, Engl. *ten* + *χορδή*, *chordē*, string, chord). A kind of guitar with ten strings, similar to the common guitar, but larger in the body, and provided with a broader finger-board. The lower strings have no frets, being used only as open notes.

DECADENCE (Fr. *décadence*, through ML. *decadentia*, from *de*, from + *cadere*, to fall). A term used with reference to works of art belonging to a school which had passed the period of its highest excellence before they were produced. In Greece, art in all its forms reached its acme in c.450-323 B.C.; and though there are many exquisite works which were produced at a later period, they all belong, more or less conspicuously, to the decadence of Greek art. In Rome, both art and literature culminated in the time of Augustus, and from that time we have a decadence which soon becomes very obvious and rapid. The art of the Italian Renaissance attained its highest development in the early sixteenth century, in the persons of such artists as Michelangelo, Raphael, Leonardo, Titian, Correggio, after whom came its decadence, to which even such artists as the Carracci and Tiepolo belong.

DÉCADENTS, dā'kā'däɴ' (It., Sp., Port. *decadente*, from Lat. *de*, from + *cadere*, to fall). The name of a class or group of young writers (particularly poets) and artists in France during the close of the nineteenth century. The term began to be derisively applied about 1882; it was used interchangeably with that of 'Symbolists'; became associated in a way with the rise of Impressionism in painting (see PAINTING, section *Modern Painting*); and has now been practically supplanted by the word 'Symbolists' (q.v.), which represents all that proved to be durable in *décadisme*. The term *décadent*, however, is still used, loosely, to designate by way of ridicule all modern writers, like Ibsen and Annunzio, whose themes at times have been atavistic, their characters 'degenerate,' and their theories of art more or less subversive.

The décadent poets in France merit distinctive notice for the rôle which they played in connection with the development of the Symbolist school or movement. Their literature may be said to have been born of the demoniacism of Baudelaire, the exaggerated realism in Zola, the haughty pessimism and gorgeous indifference of Leconte de Lisle, and the over-refining neurosis of the Goncourts, against all which influences, except that of Baudelaire, the Décadents nevertheless revolted wholly or in part like unnatural children. As for Baudelaire, they adoringly adopted him as their particular sire and model. Their more immediate avatars were Verlaine and Mallarmé. Among the Décadents of Paris there developed two general groups which naturally intermingled to some degree. The less serious class associated their verse with the *chanson populaire*. They did not shrink from repulsive themes, brutal *cochonneries*, Rabelaisian wit, the authors glorying in the extravaganzas of 'eccentrics' writing for the pavement public. Their songs were put forth in all sorts of loose, unkempt forms of verse—varieties such as had never been dreamed of in Paris. To whet their own morbid inspirations, they drank absinthe, and ate hashish and morphine. They celebrated the effects of dissipation and disease, and were proud to belong among the *poètes maudits*. They were noisy poseurs, often most ingenious and clever, and always surprising. Their cafés, notably the Chat Noir, were long frequented by a public greedy for the latest sensation.

It was the more serious class of Parisian Décadents who became a part of the Symbolist movement. They were the delicate and aristocratic brothers of the song-writers. They reflected the same traits and motives, but in a more fine-grained, literary, and enlightened manner, and in the higher forms of verse. They, too, identified themselves with urban life, and exalted its factitious stimulations and the elaborate and refined corruptions of an excessive or declining civilization. They disdained the natural, the simple, the rural, the healthful. They were rare æsthetes, dwelling in Baudelaire's 'artificial paradises,' with anæmic, satiny complexions, victims of goaded nerves, supreme egoists, in search of the unusual, the abnormal and the difficult. They prided themselves on being *savants mystificateurs*, and were distinguished by *maladive* airs and effeminate graces. What few ideas these poets, in their effaced cult of Hartmann and Buddhism, harbored and expressed, were voluntarily involved in mystic complexity, in obscurantism. They wished to substitute sensations for ideas, and art for morals. Their theories and practices in the more intimate matter of the art of poetry, however, stood out as interesting and original. It was their aim always to suggest and to mask, never to name or expose. They employed the semi effects, the neutral tones, and relied on pale motives, evaporative *nuances*, and on lingering, caressing extenuations of results. More conspicuous was their ambitious confusing of the functions of the senses, insisting on color in music and on music in color, and finding forms and perfumes in both. Their main purpose in this sphere was to interpret emotions as music and to marry it to poetry, as devoted Wagnerians. They sought to wed the flow of harmonies to liquid verse, to emphasize floating indecisions and extremely mobile sensuousnesses, earning thereby the name of 'déliquescents.' In all this they courted the neurotic, the psychical, the supranatural, and reacted against the materialistic and plastic cults of the realists and the Parnassians.

The most tangible of their innovations lay in their forms of verse—their *vers brisés*—in which they displayed attempts at blank verse or rhymed prose, and strove to expand the formal and contracted limitations of French versification. They wrote 'familiar alexandrines,' and verse of more than twelve feet; they discarded the cæsura at the hemistich, and the alternating process of male and female rhymes. In fact, rhymes and fixed forms were generally abandoned for assonances, cadences, repetitions, and for polymorphous lines which were meant to be the tonal and visible counterpart and representation of the themes versified.

The Décadents of Paris were specifically little more than curiosities; but in their connection with Symbolism they were not without effect on literature and art. Indeed, it may almost be said that the Décadents were merely the 'Symbolists' who failed. Among those who have been for one reason or another or at various times associated in France, in the public mind, with *décadisme* may be mentioned (to name a few among many) Maurice Barrès, De Régnier, Gustave Kahn; the two Belgians Maeterlinck and Rodenbach; the Greek, Moréas; the Americans, Vielé-Griffin and Stuart Merrill. The Théâtre Libre was also to some extent identified with the Décadents. In other continental countries may perhaps be cited the Swede Ola Hansson, the Norwegian Hjalmar Christiansen, the Austrian Hermann Bahr. In England Aubrey Beardsley (q.v.), with his fantastic, 'unwholesome' pictorial art, was considered a conspicuous Décadent. There have been no very characteristic echoes in English poetry, because blank verse, *vers libre*, etc., were not new to it. Consult: R. Doumic, *Les jeunes* (1896); G. Pellissier, *Etudes de littérature contemporaine* (1898); A. Symons, *The Symbolist Movement in Literature* (London, 1899).

DECAEN, de-käN′, Charles Matthieu Isidore, Count (1769-1832). A French general, famous principally for his share in the victory of Hohenlinden in 1800. In 1802 he went to India as Captain-General of the French possessions there, was obliged to surrender to the English in 1810, and, having returned in 1811, was placed in command of the army in Catalonia. He compelled the English to raise the siege of Tarragona, and was created count in 1812. When Napoleon abdicated, Decaen entered the service of Louis XVIII., but on the Emperor's return from Elba again accepted a command under him. After the battle of Waterloo he lived in retirement.

DEC′AGON (Gk. *δέκα*, *deka*, ten + *γωνία*, *gōnia*, angle). A geometric plane figure of ten sides and ten angles. When both the sides and the angles are equal, the figure is called a regular decagon. This figure is obtained from a regular pentagon (q.v.) by describing a circle around the latter, bisecting the arcs between its vertices, and drawing lines from these vertices to the points of section. See Polygons.

DECAISNE, de-kân′, Joseph (1809-82). A French botanist, born in Brussels. He studied medicine and natural science in Paris, and in 1830 became connected with the Museum of Natural History, in which he was made professor of botany in 1848. Three years later he was appointed to a similar post at the Jardin des Plantes. His published works include the following: *Herbarii Timoriensis Descriptio* (1835); *Plantes de l'Arabie heureuse, recueillies par Botta* (1841); *Histoire de la maladie des pommes de terre* (1845); *Rcoherches anatomiques et physiologiques sur la garance* (1847); *Flore élémentaire des jardins et des champs*, jointly with Lemaout (1855; 2d ed. 1865); *Traité général de botanique descriptive et analytique*, jointly with Lemaout (1867); *Le jardin fruitier du Muséum* (9 vols., 1858-78); *Manuel de l'amateur des jardins*, jointly with Naudin (4 vols., 1862-72).

DECALOGUE (Gk. *δεκάλογος*, *dekalogos*, ten sayings, from *δέκα*, *deka*, ten + *λόγος*, *logos*, word). The term usually applied by the Greek fathers to the law of the two 'tables of testimony' given, according to the Book of Exodus, by Jehovah to Moses on Mount Sinai (Ex. xx. 1-17). In the Hebrew original they are designated as 'ten words' (Ex. xxxiv. 28). According to the narrative, these tables were made of stone, and the commandments inscribed thereon were "written by the finger of God." Afterwards, when the tables were broken by Moses, he was commanded to hew others, on which Jehovah again wrote the ten words (Ex. xxxiv.). The commandments are not numerically divided in the Pentateuch, and it has been supposed by some that the number ten was chosen because ten was considered the most perfect number. As, however, there are ten distinct injunctions, it is superfluous to allege any other reason for the division than the simple fact that this is the correct enumeration. Philo divides them into two pentads, the first ending with "honor thy father and thy mother," etc.; but the general opinion among Christians is that the first table contained those commandments which enjoin upon us our duty to God (comprising the first four), and the second those which enjoin upon us our duty to our fellow-creatures (comprising the last six). The Talmudists make the introductory words, "I am the Lord thy God, which have brought thee out of the land of Egypt, out of the house of bondage," to be the first commandment, and, in consequence, to keep the number ten, they make the next two (verses 3-6) into one. But the words quoted obviously contain no command at all, and merely express the general reason why the Israelites should yield implicit obedience to the injunctions which follow. Hence Origen commences the Decalogue with, "Thou shalt have no other gods before me." His division is that in use in the Greek, and in all the Protestant churches except the Lutheran; while from the writings of Philo and Josephus it appears that such was also the division received in the Jewish Church. The Roman Catholic and Lutheran churches also make verses 3-6 one commandment. To preserve the number ten they divide verse 17 into two commandments, the first being "Thou shalt not covet thy neighbor's house," and the second, "Thou shalt not covet thy neighbor's wife, nor his man-servant," etc., to the end. The two tables are said to have been placed in the ark of the tabernacle as a testimony of Jehovah's revelation (Ex. xxv. 16).

Modern scholars of the critical school hold that there are two texts of the Decalogue—(1) Ex. xx. 2-17, and (2) Deut. v. 6-21—which present some striking differences. The commands in both are the same—viz. (1) prohibition of any worship besides that of Jehovah; (2) prohibition of graven images; (3) prohibition of the use of the name Jehovah for vain purposes; (4) the Sabbath command; (5) command to honor father and mother; (6) prohibition of murder; (7) prohibition of adultery; (8) prohibition of stealing; (9) prohibition of bearing false witness; (10) prohibition of coveting one's neighbor's property. But the text in Deuteronomy is believed to contain various amplifications, notably in the case of the fourth, fifth, and tenth commandments; and, moreover, while in Exodus the reason for hallowing every seventh day is as a memorial of the creation of the world in six days and of God's resting on the seventh, in Deuteronomy the observance of the Sabbath is enjoined as a reminiscence of the Exodus from Egypt. Of the two versions that in Exodus is regarded as the older form, though even in this one amplifications have been introduced which did not belong to it in its original form. Still even in its earliest form the Decalogue cannot be much older than the eighth century. Its general tone is moral rather than ritual. This circumstance, with the stress laid upon the prohibition of image-worship, calls for a date later than the age of Elijah and Elisha. A comparison of the Decalogue with Micah vi. 6-8 has been suggested by various scholars, and there is much in favor of placing the composition in the same age. Traces of an older Decalogue have been discovered in Exodus xxxiv. Here we find (verses 10-26) chiefly ritualistic ordinances: (1) Not to worship any other god but Jehovah; (2) not to make any molten images; (3) to keep the feast of unleavened bread; (4) to give the firstlings to Jehovah; (5) to observe the feast of weeks; (6) to keep the feast of ingathering; (7) not to mix the blood of the sacrifice with leaven; (8) not to leave the fat of the sacrifice till morning; (9) to bring the first fruits to Jehovah; (10) not to seethe the kid in the mother's milk. Such a decalogue belongs to an earlier period, and may have formed the prototype for later ethical ones, though even this one is placed several centuries after Moses.

DECAM'ERON (It. *Il Decamerone*, from Gk. *δέκα*, *deka*, ten + *ἡμέρα*, *hēmera*, day). A famous collection of stories by Boccaccio (q.v.), supposed to have been told on ten successive days by a party of young people who in 1348 had retired to a villa outside of Florence in order to escape the plague, which was then raging within the city. See GALEOTTO, IL PRINCIPE.

DE CAMP, JOHN C. (1812-75). An American naval officer, born in New Jersey. He entered the service as midshipman in 1827, became commander in 1855, and commanded the *Iroquois* at the capture of New Orleans in 1862. Afterwards he played a gallant part in various actions on the Mississippi, especially under Farragut at Vicksburg. He was raised to the rank of commodore in 1866, and retired in 1870 as rear-admiral.

DECAMP', JOSEPH RODEFER (1858—). An American painter of landscape and figures. He was born in Cincinnati, Ohio; studied in Cincinnati and in Munich; was elected to the Society of American Artists in 1888. Impressionism, modified by a realistic treatment, characterizes his paintings. He received the Temple gold medal from the Pennsylvania Academy of Fine Arts in

1899, honorable mention at the Paris Exposition of 1900, and a gold medal at the Saint Louis Exposition in 1904.

DECAMPS, de-käN′, ALEXANDRE-GABRIEL (1803-60). A French painter, born in Paris, March 3, 1803. He was a pupil of Abel de Pujol, but was in no way restricted by the traditions of the conventional and classic in art. His work that appeared in the Salon of 1827—painted in his twenty-fourth year—was not at first pleasing to his fellow-artists, but its originality and style attracted and pleased the public. Of early instruction he had received little, regarding lessons 'monotonous.' He preferred to grope his way alone, but in later years acknowledged himself handicapped for lack of early training. Once, visiting the studio of Millet, he exclaimed, "Ah! you are a lucky fellow; you can do all you wish to do." "The sting of his artistic conscience" was always with him, making him discontented and restless even over his best work. Decamps's genius finally expressed itself in landscape and genre, and in Oriental subjects which introduced both. He was of the naturalistic school, seeking every-day topics in the streets, on the quays, and in the fields. He reveled in color and in effects of atmosphere and light, and he managed these qualities in his pictures in a way that was as fascinating as nature itself. Before he visited the East, in 1827, he had painted suggestions of the Orient, and he early laid the foundation of that French school of Orientalism that was later to include Gérôme, Ziem, Constant, and Frère. His first paintings of genre subjects were so popular that in time he suffered from their successes, as it was difficult for him to depart from that style of work, though he aspired to the historical in his nine sketches of the history of Samson. As a landscape painter he sympathized with the English Constable, and really took a high position in his interpretation of nature. Light and atmosphere dominated his works. It was the modern note that was handed on to the school of Impressionists, the Monets and Manets. Decamps liked to indulge his brush in satirical work, and "The Monkey Experts" and his travesties of Charles X. display his skill in that direction. He touched the high-water mark of his popularity in 1839, in his exhibits at the Salon, where his "Café in Asia," "Street of a Roman Village," "Children Playing Near a Fountain," and other examples of his figure subjects and landscapes made him chevalier of the Legion of Honor. But the authority of the classic school at that time made Decamps uncertain of himself and discouraged with his profession. In this mood he burned many of his works and retired to the country, ignoring art for many years. He lost his life August 22, 1860, as the result of an accident while riding to the hunt.

Consult: Stranahan, *Modern French Painters* (New York, 1888); Chaumelin, *Decamps, sa vie et son œuvre* (Marseilles, 1861); Im-Thurn, *Scheffer et Decamps* (Nîmes, 1876); Clément, in *Les artistes célèbres* (Paris, 1886); Chesneau, *Mouvement moderne en peinture: Decamps* (Paris, 1861); Moreau, *Decamps et son œuvre* (Paris, 1869).

DE CANDOLLE, de käN′dōl′, AUGUSTIN PYRAME (1778-1841). A celebrated Swiss botanist. He was born in Geneva, Switzerland, where he obtained his early education. While still a youth his ability to study and his attainments in literature were in marked contrast to his weak constitution. The gracefulness of his verse led Florian to predict a future for him as a poet. Law and medicine at first attracted him, but his love of plants, which had been aroused in 1792, while he was living with his mother in a village during the siege of Geneva, and which had been growing, through the influence of Saussure and especially of Vaucher, led him to adopt the study of botany as his life work. In 1796 he removed to Paris, where his first works, *Historia Plantarum Succulentarum* (Paris, 1799), and *Astragalogia* (Paris, 1802), attracted the attention and gained him the friendship of scientists, among whom were Cuvier, to whose chair in the Collège de France he was elected in 1802; and Lamarck, who intrusted to him the publication of *Flore Française* (Paris, 1803-15), in the introduction of which work he elaborates and enforces Jussieu's natural system of plant classification as opposed to the Linnæan or artificial system. In 1804 the medical faculty of Paris awarded him the degree of M.D. Beginning with 1806, he spent six summers in the service of the Government making a botanical and agricultural survey of the entire country, a report of which appeared in 1813. In 1807 he became botanist and director of the botanical garden in the medical faculty of the University of Montpellier, and three years later was transferred to the newly created chair of botany in the science faculty. During this incumbency he published *Théorie élémentaire de la botanique* (Montpellier, 1813; 2d ed. 1819, reprint 1844)—a work that greatly extended his reputation and the popularity of the natural method of plant classification. In 1816 he accepted the newly founded chair of natural science, and, conjointly with his son, the directorship of the botanical garden at Geneva, which offices he held until 1834, when his son succeeded him. He spent the remainder of his life in Geneva. In 1824 he commenced the *Prodromus Systematis Regni Vegetabilis* (Paris, 1824-74), based upon a former work (*Regni Vegetabilis Systema Naturale*), which had been planned upon too prodigious a scale for one man to complete, and of which only two volumes were published, in 1819 and 1821 respectively. Even of this more condensed work he was able to complete only seven volumes; the remaining fourteen are the work of his son. He published other books and pamphlets, whose value, though considerable, is eclipsed by the works already mentioned. As a lecturer he exerted a wide influence and as a citizen was highly esteemed. Among the numerous honors awarded him was the cross of the Legion of Honor, which he received from Louis Philippe.

DE CANDOLLE, ALPHONSE LOUIS PIERRE PYRAME (1806-93). A celebrated botanist, son of Augustin de Candolle (q.v.). He was born in Paris. His early education, like that of his father, was obtained in Geneva, where the greater part of his life was spent, in the chair of natural science vacated by his father, in which, besides making botanical investigations of his own, he continued his father's monumental work, the *Prodromus Systematis Regni Vegetabilis*. His most important botanical writings are: *Introduction à l'étude de la botanique* (Paris, 1835); *Géographie botanique* (Paris, 1855); *Lois de la nomenclature botanique* (Paris, 1867);

La phytographie ou l'art de décrire les végétaux (Paris, 1880); and *Origine des plantes cultivées* (Paris, 1883). Besides these works he wrote a history of the sciences and scientists of the last two centuries (Geneva, 1872), and edited the memoirs and souvenirs of his father (Geneva, 1862).

DECAP'ODA (Neo-Lat. nom. pl., from Gk. *δεκάπους, dekapous,* from *δέκα, deka,* ten + *πούς, pous,* foot). (1) The largest and most important order of malacostracan crustaceans, distinguished by the fact that the carapace is firmly grown to the dorsal side of all the thoracic segments, and that the last five pairs of thoracic appendages serve as walking feet, while the first three pairs are mouth-organs. All of the crustaceans ordinarily used for food (crabs, lobsters, shrimps, and prawns) are decapods. Many hundred species are known, and they are found in all parts of the world, on land and in fresh water, but chiefly in the sea. The decapods contain three groups—the long-tailed (*Macrura*), the short-tailed (*Brachyura*), and the peculiar-tailed (*Anomura*). The first has the abdomen long and covered by a hard shell, and the lobster, crayfish, prawn, etc., are good illustrations; the second suborder has the abdomen very short and weak (this group is made up of the crabs): while the third includes the hermit-crabs, which seem to be intermediate between the others. See Crab; Crustacea; Lobster.

(2) A suborder of dibranchiate cephalopods, having ten arms, the squids. See Cephalopoda; Squid; and Colored Plate of Decapods and Octopods.

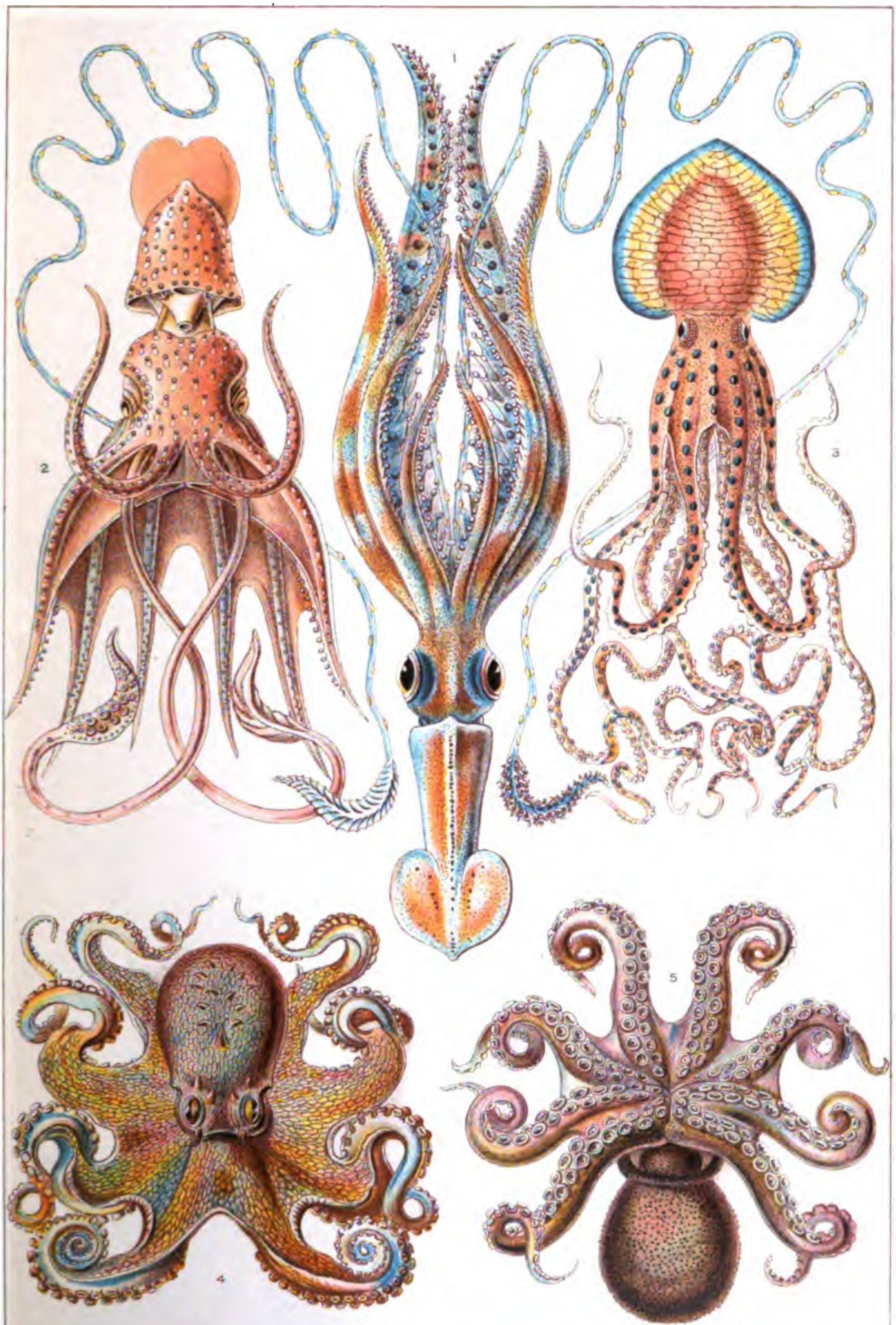
DECAP'OLIS (Lat., from Gk. Δεκάπολις, *Dekapolis,* ten cities). A geographical term used in Josephus, the New Testament (Matt. iv. 25; Mark v. 20; vii. 31), and other ancient writings to designate certain districts in and near Palestine, situated mainly east of the Jordan. The Decapolis was a confederacy or league, originally of ten cities, though the number was not constant, apparently having been increased in the second century. The details of the history of the confederation are somewhat obscure. Its outlines can be recovered, however, with a good degree of certainty.

When Alexander the Great conquered the East (B.C. 331), the ancient Semitic world was at once opened to the influences of Greek civilization. Many of Alexander's veterans either settled in cities already founded, or established new ones for themselves. Palestine, outside of Judea proper, was not exempt from this movement, and soon here and there throughout the ancient Hebrew territory numerous Greek cities came into existence. These cities, all constituted after the same general idea of the Greek *polis,* were centres of Greek culture. During the Maccabean War of Independence (B.C. 167-141), waged by the Jews against the Greek-Syrian Kingdom, their sympathies were with Syria. Consequently, with the triumph of the Jews, and especially during the reigns of the Asmonæan princes, John Hyrcanus (B.C. 135-105) and Alexander Jannæus (B.C. 104-78), they suffered great hardship, in many cases being deprived of their independence. In B.C. 63, when Pompey took charge of affairs in Syria and Palestine in the name of Rome, he freed them from the Jewish yoke. It was probably at this time that ten of these cities formed the league known as the Decapolis. The charter members seem to have been Scythopolis (the only one west of the Jordan), Dium, Pella, Gadara, Hippos, Gerasa, Philadelphia, Damascus, Raphana, and Kanatha. Such is the list given by our earliest authority, Pliny the Elder (Hist. Nat. v. 18), in the first century. The geographer Ptolemy, in the second century, omits Raphana, but adds nine other names, making eighteen in all belonging to the league in his time. The purpose of the confederation was in part to secure better protection against enemies, such as the Jews and the Arabian tribes, who were naturally hostile to Roman and Greek influences. Another equally powerful motive was the desire to obtain better trade advantages. The members of the league were all situated on trade routes. Each one of these cities covered with its jurisdiction a large adjacent district. Yet the Decapolis was not one solid territory, but between the districts belonging to the respective cities were large tracts governed by the various tetrarchies or other forms of government permitted by Rome to exist under her general supervision. The most compact part of the Decapolis lay just south and east of the Sea of Galilee. Here the regions of Scythopolis, west of the Jordan and on the main line of communication with the East-Jordan territory; of Hippos, east of the Sea of Galilee; and of Gadara, south of Hippos, on the Hieromax, the ancient Yarmuk, were contingent, each possessing a section of the shore of the lake. This was the Decapolitan region referred to in the Gospels as the scene, for a brief time, of Jesus's ministry and into which His fame spread. South of Gadara, bordering on the Jordan Valley, were Pella and Dium, both probably founded by Alexander's veterans. East of these were the districts belonging to Abila on the Yarmuk; a late addition, Gerasa, farther south and very extensive; and Philadelphia (the ancient Rabbath-Ammon of the Old Testament), the most southern member of the league. To the northeast were the cities Kanata, Kanatha (the ancient Kenath of Num. xxxii. 42), now called Kanawat, both on the western slope of the Hauran Hills, and Damascus. Other members, such as Edrei and Bosra, though old cities, were late additions, and carried the influence of the league eastward, south of the Hauran.

From the organization of the league until the third century—a period of nearly three hundred years—the Decapolitan country was exceedingly prosperous. When Trajan organized the Province of Arabia (B.C. 106) the security of the region was assured, commerce expanded, literature and art flourished, and in all conditions this was one of the most-favored regions of the Empire. Of the cities making up the league, some were of more than ordinary size and importance. The ruins of Gerasa (the modern Jerash) are very extensive; the amphitheatre of Philadelphia had a seating capacity of more than seven thousand; Gerasa had a *naumachia.* Greater than any of these, in Josephus's day, was Scythopolis, the ancient Beth-shean (modern Beisan), west of the Jordan, famous for its linen manufactures. The confederation seems to have dissolved gradually. Some of the cities became incorporated with the Province of Arabia; others maintained their independent position until the break-up of the Roman Empire.

Consult: Schürer, ***History of the Jewish Peo-***

OCTOPODS AND DECAPODS



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

1 CHIROTEUTHIS VERANYI
2 HISTIOTEUTHIS RUPPELLII
3 PINNOCTOPUS CORDIFORMIS.
4 COMMON OCTOPUS (OCTOPUS VULGARIS)
5 OCTOPUS GRANULATUS.

ple in the Times of Jesus Christ (New York, 1885); G. A. Smith, *The Historical Geography of the Holy Land* (New York, 1896).

DE CASSAGNAC, de kȧ'sȧ'nyȧk', PAUL GRANIER. See GRANIER.

DECA'TUR. A city and county-seat of Morgan County, Ala., on the south bank of the Tennessee River, about 18 miles above the Muscle Shoals, and on the Louisville and Nashville and the Southern railroads (Map: Alabama, B 1). It has charcoal and iron furnaces, bridge and car works, foundries, engine works, and manufactures of lumber, sashes and blinds, furniture, agricultural implements, flour, leather, cotton, cottonseed oil, etc. Population, in 1890, 2765; in 1900, 3114.

DECATUR. A town and county-seat of De Kalb County, Ga., six miles east-northeast of Atlanta; on the Georgia Railroad (Map: Georgia, B 2). A fine climate and a beautiful situation make the town popular as a residential place. It is the seat of the Agnes Scott Institute (Presbyterian) for Girls and the Donald Frazer (Presbyterian) High School for Boys. Here, on July 20, 1864, the battle of Peachtree Creek (q.v.) was fought, the Confederates, under General Hood, attacking unsuccessfully part of Sherman's army under Generals Thomas and Schofield. Decatur was settled and incorporated in 1823. Population, in 1890, 1013; in 1900, 1418.

DECATUR. A city and county-seat of Macon County, Ill., 38 miles east of Springfield and 173 southwest of Chicago; on the Sangamon River, and on the Illinois Central, the Wabash, and other railroads (Map: Illinois, D 4). It contains a Carnegie library, Fairview and Riverside parks, and James Millikin University. The city is in a fertile agricultural section, and, owing to its exceptional railroad facilities, has large trade and shipping interests, particularly in grain. It is also an important industrial centre, manufacturing iron, agricultural implements, furniture, corn-flour, meal, and hominy, plumbing, waterworks, electric-light fixtures, coffins, etc. The government is vested in a mayor, elected every two years, a city council, and administrative officials, the majority of whom are appointed by the mayor. The city clerk, attorney, and treasurer are chosen by popular vote. The water-works and electric-light plant are owned and operated by the municipality. Decatur was settled in 1830 and incorporated six years later. Population, 1900, 20,754; 1905 (local census), 27,770.

DECATUR. A city and county-seat of Adams County, Ind., 21 miles southeast of Fort Wayne; on Saint Mary's River, and on the Toledo, Saint Louis and Western, the Erie, and other railroads (Map: Indiana, E 2). It has several fine stone-quarries, and manufactures of lumber in various products, machinery, tiles, etc. Decatur was settled in 1840 and incorporated in 1882. The government is administered by a mayor, elected every four years, and a city council. The city owns and operates its water-works and electric-light plant. Population, in 1890, 3142; in 1900, 4142.

DECATUR. A town and the county-seat of Wise County, Tex., 40 miles north by west of Fort Worth; on the Fort Worth and Denver City Railroad (Map: Texas, F 3). It is the seat of the Northwest Texas Baptist College. The city is the centre of a corn and cotton growing section, and has cotton-gins, a cottonseed-oil mill, a rolling-mill, a canning-factory, etc. Limestone is extensively quarried in the vicinity. Population, 1900, 1562; 1906 (local est.), 2000.

DECATUR, STEPHEN (1751-1808). An American naval officer, born in Rhode Island. He early adopted a sea life, and during the Revolution had command of several privateers. In 1798 he became a captain, and was put in charge of the *Delaware*, 20 guns, with which he captured two French privateers. On the declaration of peace he went into business in Philadelphia. His son Stephen (q.v.) attained great distinction in the navy.

DECATUR, STEPHEN (1779-1820). An American naval officer, born in Sinnepuxent, Md., January 5, 1779. He entered the navy as midshipman on board the *United States*, in 1798. In November, 1803, he had command of the *Norfolk*, and afterwards of the *Enterprise*. On February 16, 1804, at the head of a small party, he made a dash into the harbor of Tripoli and burned the frigate *Philadelphia*, which had fallen into the hands of the Tripolitans. In recognition of this act, which Admiral Nelson pronounced "the most daring of the age," he was made captain, and was presented with a sword. Decatur had much more hard fighting in the harbor and neighborhood of Tripoli, and in all cases showed the utmost daring and bravery. In 1812 he was in command, as commodore, of a squadron off the Atlantic coast, and on October 25, in the *United States*, captured the English frigate *Macedonian*. From 1813 till the summer of 1814 he was forced by a British blockading squadron much superior to his own to remain in the harbor of New London. In January, 1815, he attempted to get to sea from New York with a small squadron. His flag-ship, the *President*, was injured by striking on the bar at Sandy Hook. He had not proceeded far when he was pursued and forced to engage in an unequal fight. He was finally overpowered and compelled to surrender, and was taken to Bermuda with his frigate. He was soon paroled, and in May, 1815, sailed from New York as commander of three frigates, one sloop, and six brigs and schooners, to operate against Algiers. He captured two important vessels; but the war was soon concluded by a treaty abolishing the demand upon the United States for tribute and giving up all prisoners. He made similar arrangements with the rulers of Tunis and Tripoli, and thus put an end to the enslaving of the Americans by the corsairs of those countries. In November, 1815, he was made navy commissioner, with Commodores Rodgers and Porter, holding the office until his death, March 22, 1820, in a duel at Bladensburg, near Washington, with Commodore James Barron (q.v.). Consult the *Life* by Mackenzie (Boston, 1846), and Brady, *Stephen Decatur* (Boston, 1900). His nephew, STEPHEN (1815-76), was commodore in the United States Navy.

DECAZES, de-kȧz', ELIE, Duke (1780-1860). A French statesman. He began his career as a lawyer, became a judge in Paris, and in 1806 was called to Holland by King Louis, who esteemed him highly as his trusted counselor. Afterwards he became secretary to Napoleon's mother, Letizia Bonaparte, joined the Bourbons after the Restoration, and won the favor of

Louis XVIII., who made him prefect of police, Minister of Police, and in 1818 Prime Minister. He carried out a number of liberal measures, but did not succeed in pleasing the radicals, and at the same time incurred the enmity of the ultra-royalists, who availed themselves of the murder of the Duke de Berry in 1820 to accuse Decazes of complicity in the crime, alleging that his revolutionary policy had instigated the assassin to his deed. The King accepted his minister's resignation with great reluctance, and sent him as Ambassador to England. Having returned in 1821, Decazes took part in all important debates in the Chamber of Peers, opposing the Government, and after the Revolution of 1830 supported the Orleans dynasty. He retired from public life in 1848 and thereafter devoted himself to the administration of his estates.

DECAZES, LOUIS CHARLES ELIE AMANIEU, Duke de Glücksberg (1819-86). A French diplomat, born in Paris. His father was the statesman Elie Decazes, and through his influence Decazes became secretary to the embassy in London, and afterwards Minister Plenipotentiary to Spain and Portugal. The Revolution of 1848 forced him to retire to private life, but he remained a devoted Orleanist, and always hoped for a restoration of the dynasty. In 1873, after having been for a short time Ambassador at London, he was given the portfolio of Foreign Affairs. He resigned in 1877.

DEC′CAN (Hind. *dakhan*, Prak. *dakkhana*, Skt. *dakṣiṇa*, southern, pertaining to the right hand, from *dakṣa*, right hand; connected with Gk. δεξιός, *dexios*, Lat. *dexter*, right). A term sometimes applied to the peninsula of India (Map: Asia, G 7), south of the Nerbudda, but now generally restricted to the portion bounded on the north by the Nerbudda and on the south by the Kistna or Krishna. In a still narrower sense, the name is applied to the elevated plateau region of the interior. It is also the official designation of a division of the Bombay Province.

DECCAN HEMP. See HIBISCUS.

DECEASED WIFE'S SISTER. By the law of England the marriage of a widower with the sister of his deceased wife is null and void. The origin of this law may be traced to the interpretation of the early Church upon the old Mosaic law as to marriages, contained in Lev. xviii. Formerly the ecclesiastical court had power to declare such marriages void during the lifetime of both parties, thus rendering their children illegitimate; but until so declared they remained voidable. This led to great confusion, and in 1835 Parliament passed a statute, 5 & 6 Will. IV., c. 54, known as Lord Lyndhurst's Act, which provided that all such marriages should be null and void. Since that time there has been great opposition to this law, and bills have been introduced into practically every Parliament, including the session of 1905, but have always been defeated. Relationship by affinity is not considered a bar to marriage in the United States, although the English law in this regard obtained in a few States until recent years. It has been abolished in the various countries of Europe and in most of the English colonies. See AFFINITY; CONSANGUINITY; MARRIAGE.

DECEBALUS, dė-sĕb′ȧ-lŭs (Lat., from Gk. Δεκέβαλος, *Dekebalos;* supposed to be a title of honor equivalent to *king*). A king of Dacia, who for a number of years was one of the most formidable of the enemies of Rome and was a military leader of no mean ability. He crossed the Danube during Domitian's reign, overran Mœsia, and defeated the Imperial army under Cornelius Fuscus. Later he forced Domitian to conclude a treaty, according to the terms of which the latter was to pay an annual tribute. He was completely overthrown by Trajan in A.D. 105, and his territories were reduced to a Roman province. He committed suicide to escape capture by the conquerors about 106.

DECE′DENT (Lat. *decedens*, from *decedere*, to depart, die). Strictly, a dying person; in English and American law, a deceased person—the term being employed only in connection with the passing of the estate of such person, or the administration thereof. When the estate in question is disposed of by will, the decedent is properly described as 'testator,' or 'devisor,' and thus the term decedent has come to be commonly appropriated to a person dying intestate. As thus restricted, decedents' estates come under the operation of two distinct sets of rules, which, though now usually embodied in statute form, do not depart in essential particulars from the common-law doctrines in which they originated. These rules are, first, that the real estate of a decedent shall descend to his heir, and, second, that his personal property shall pass to his personal representative for purposes of administration and distribution. This personal representative may or may not be a person entitled to share in the ultimate distribution of the property, and under some circumstances the duty of administration is undertaken by the State. In the early history of the law in England it devolved upon the Church, the right of administering upon the estate of a decedent being vested in the bishop of the diocese in which he died, such administration, together with the probate of wills, constituting an important part of the ordinary jurisdiction of the ecclesiastical courts. This jurisdiction has now been assumed by the High Court of Justice in England. In the United States it is commonly exercised by local tribunals of the rank of county courts, known, variously, as surrogates' courts, probate courts, orphans' courts, and the like. See those titles; also DESCENT; DISTRIBUTION; HEIR; PERSONAL REPRESENTATIVE; EXECUTOR; ADMINISTRATION.

DECEIT. In law, a misrepresentation or other device or contrivance by which one man intentionally deceives another to the legal injury or damage of the latter. The deceit need not be accomplished by any spoken or written words, or by any positive statement or representation; but the concealment of any fact or circumstance which the deceiver is under a legal obligation to disclose, or his mere silence concerning it when the circumstances are such as to put upon him an obligation to speak, amount to deceit as fully as if positive misrepresentation was made. But mere silence concerning matter which there is no obligation to disclose is not generally deceit, even though the party misled may be known to be acting upon a false idea as to those facts. Thus, if A sells a plot of land to B, who pays a larger price for it than he otherwise would have done because he supposes it to contain deposits of iron, there is no legal deceit, if A knows of B's supposition and takes advantage of it to obtain a high price for the land, provided A does not in any way contribute to B's mistaken idea, nor give or make any false statements or representations concerning the supposed deposits, either directly or indirectly. If B were to ask A if there were such deposits, and A should reply that he did not know, when he knew there were none, or lead B to suppose he did not know, this would be deceit. Deceit involves as a necessary element the *intention* to deceive in a matter in which the deceived party has a right to know the truth and rely upon it. Without this intent a misrepresentation might amount to a legal mistake, but would not be a basis for an allegation of the tort of fraud.

If the party deceived be in a position such that by the exercise of due caution or diligence, or by duly taking advantage of matters open to his knowledge, he would not have been deceived, there is no legal deceit, even though his reason for failing to take reasonable care was due to his confidence in the honesty of the party by whom he is deceived. If, however, he is dissuaded from the exercise of his caution by the actions of the other party intended to so dissuade him, there is deceit. The misrepresentation or misleading must be in respect of matters material to the transaction concerned, and must be relied upon to the deceived party's prejudice in the same transaction in order to lay a basis for an action. Misrepresentations as to matters of law are not generally sufficient to lay a basis for an action, although the circumstances may be such as to make them so. Reckless statements, made without any regard to whether they are true or not, or false statements, made in the belief that they are true when the party making them is legally bound to know and state the true facts, are legally deceitful. But mere expressions of opinion, or of anticipation as to what will happen in the future, is not deceit.

Deceit is a necessary element of a fraud, and no exact or absolute definition or statement can be given of what is deceit, except in a general way, as above. (See FRAUD.) The term deceit is used as a name of a writ formerly used in an action for acknowledging a fine (q.v.) in another name, but this action and writ are now obsolete.

DECEMBER. See MONTH.

DECEM'VIRI (Lat., board of ten men, from *decem*, ten + *vir*, man). The most famous body known under this title were the ten persons who were appointed (B.C. 451) as a sort of legislative committee, to draw up a code of laws at Rome. The groundwork on which the decemviri proceeded was the information which had been previously collected by three commissioners who were sent for that purpose to Greece. On the return of the commissioners, after a year's absence, a violent dispute arose between the patricians and plebeians as to which of the orders should be intrusted with the revision of the laws. The dispute ended in favor of the patricians, and ten patrician lawgivers were consequently appointed, to whom, moreover, the whole government of the State was intrusted during the year for which they were to hold office. The experiment was eminently successful; the work of legislation was carried on with zeal and success, and the State was governed with prudence and moderation. Their labors not being quite finished, a new body of decemviri was appointed, only one, the notorious Appius Claudius, belonging to the previous commission. In their magisterial and executive capacities, the new decemviri acted in the most tyrannical manner. In place of the fasces alone being carried before the decemvir who presided for the day, as on the former occasion, each of the ten was now attended by twelve lictors, who carried not only the rods, but the axe, which was the emblem of sovereign power, Every species of outrage was committed on the persons and families of the plebeians, and when the term of their appointment expired, the decemviri refused either to resign or to allow successors to be appointed to them. At length the iniquitous decision of Appius Claudius (q.v.) in the matter of Virginia brought affairs to a climax. A popular insurrection broke forth, the decemviri were driven from their office, and the tribunes and other ordinary magistrates of the Republic were reappointed. The occurrence is the subject of one of the most spirited of Macaulay's *Lays of Ancient Rome.*

DECEN'NARY. See TITHES.

DECEN'NIAL GAMES (Lat. *Decennalia*, nom. pl., from *decem*, ten + *annus*, year). The games celebrated in ancient Rome to commemorate the nominal refusal of Augustus to be Emperor for life, and his preference for reëlection once in ten years. They were maintained as a popular amusement until the last days of the Empire.

DECEPTION. See FRAUD.

DECEPTION ISLAND. One of the South Shetland Islands in the Antarctic Ocean, situated in latitude 62° 55′ S. and longitude 60° 35′ W. It contains a volcano 1800 feet high, and possesses a good harbor.

DE CESARE, dā chā'zȧ-rā, CARLO (1824—). An Italian political economist and legislator. He was born at Spinnazola, Province of Bari, and studied at Naples. He became secretary general of the Neapolitan finances in 1860, and of agriculture, industry, and commerce in 1868. His works include: *Il mondo civile ed industriale nel XIX. secolo* (1857); *Del potere temporale del Papa* (2d ed. 1861); *Il primo unitario italiano* (2d ed. 1861); *La Germania moderna* (2d ed. 1874).

DECHAMPS, de-shäN', ADOLPHE (1807-75). A Belgian statesman, born at Melle, East Flanders. He became Governor of the Province of Luxembourg in 1842 and Minister of Public Works in 1843. He was the foremost promoter of railroad communication in Belgium, and, in association with de Decker, was the founder of the *Revue de Bruxelles*, a Catholic organ which exerted a marked influence from 1837 to 1850. He had considerable ability as a writer, and a thorough familiarity with the political conditions of his time, as evidenced by his works, which include: *L'Empire et l'Angleterre* (1860); *La France et l'Allemagne* (1865); *Le Prince de Bismarck et l'entrevue des trois empereurs* (1873).

DECHEN, dā'ken, HEINRICH VON (1800-89). A German geologist and engineer, born in Berlin. He studied for some time at the university of that city, but soon devoted himself to practical mining, and subsequently held a number of important Government positions. In 1834 he was made professor of mining engineering in Berlin, and in 1841 director of mines at Bonn. Besides a number of valuable geological maps, Dechen's published works include: *Geognostische Umrisse der Rheinlande zwischen Basel und Mainz* (2 vols., 1825); *Geognostische Beschreibung des Siebengebirges* (1852); and *Die nutzbaren Mineralien und Gebirgsarten im Deutschen Reich, nebst einer physiographischen und geognostischen Uebersicht des Gebietes* (1873). He was also for many years editor of the *Archiv für Mineralogie, Geognosie, Bergbau- und Hüttenkunde.* His investigations of the geological structure of the Rhineland and Westphalia formed his chief contribution to science.

DECID′UOUS PLANTS (Lat. *deciduus*, falling down or off, from *de*, away + *cadere*, to fall). Plants which have organs that are shed periodically. The term deciduous is applied in particular to those trees and shrubs that shed their leaves at the approach of a season of cold or drought. See DURATION; FORESTS; TREES.

DECIDUOUS TEETH. See TEETH.

DEC′IMA (Lat., fem. of *decimus*, tenth, from *decem*, Engl. *ten*). In music, (1) an interval of ten diatonic degrees (for example, from C to E), or practically the third above the octave, as which it is treated in harmony. There are only two cases in which it is treated differently from the third: first, in double counterpoint, where a necessary difference must be made although the same harmonic rules apply; and second, in thorough-bass, where the figure 9 shall rise a degree to 10, instead of falling a degree to 8. (2) An organ stop, called also double tierce, pitched a tenth higher than the eight-foot stops.

DECIMAL FRACTION. See FRACTION.

DECIMAL NOTATION. See NOTATION.

DECIMAL SYSTEM (from Lat. *decimus*, tenth). A name applied to any system of weights, measures, money, etc., in which the standard unit is divided into tenths, hundredths, etc., for the denominations below it, and multiplied by 10, 100, etc., for those above it. An excellent example is that of the French or metric system of measures. The meter (approximately 39.37 inches in length) is the unit of linear measure, and serves as a foundation for the measures of length, surface, volume, capacity, and weight. For the higher denominations the Greek *deka, hekto, kilo, myria,* are prefixed to signify the multiples 10, 100, 1000, 10,000, respectively. Thus 1 dekameter = 10 meters; 1 hektometer 100 meters, and so on. On the other hand, the Latin prefixes *deci, centi, milli,* are used to express divisions by 10, 100, etc., and thus furnish names for the lower denominations; e.g. 1 decimeter = $\frac{1}{10}$ of a meter; 1 centimeter = $\frac{1}{100}$ of a meter. Similarly with money; the franc being the unit, a decime is the tenth part of a franc, and a centime the hundredth part. The monetary system of the United States of America, like that of nearly every civilized country except England, is decimal. Indeed, the numerical system in general use the world over is the most notable example. See METRIC SYSTEM; NUMERALS; NOTATION; and FRACTION.

DEC′IMA′TION (Fr. *décimation*, Lat. *decimatio*, from *decimare*, to decimate, from *decem*, ten). A punishment sometimes inflicted in the armies of ancient Rome. In instances where a crime had been committed by soldiers en masse, which would merit death in the individual, one-tenth of the whole number would be put to death. The individuals were selected by lot.

DECIUS, dē′shĭ-ŭs, GAIUS MESSIUS QUINTUS TRAIANUS. A Roman Emperor (A.D. 249-251). He was a native of Pannonia, and of Illyrian stock. He commanded the troops of the Emperor Philippus on the Danube, and in A.D. 248, at the end of the year, his soldiers in Mœsia revolted, and forced him, against his will, to proclaim himself emperor, and lead them into Italy. Philippus marched against him, but was slain in battle near Verona. In 250 Decius ordered all Christians to renounce their faith, and a cruel persecution ensued, notably at Rome, Carthage, Alexandria, Jerusalem, and Antioch. Fabianus, Bishop of Rome, was martyred on January 20, Cyprian, Bishop of Carthage, was forced to leave his see, and the bishops of Alexandria and Antioch perished in prison. The great Origen also was cast into prison and tortured in Cæsarea. In the following year (251) Decius was called to Thrace to check a great invasion of the Goths, but was abandoned by his general, Trebonianus Gallus, who sought the throne for himself, and Decius, together with his son, perished in battle.

DECIUS MUS, PUBLIUS. Father, son, and grandson, consuls and generals of the Roman Republic, around whose memory grew traditions of noble heroism. The first commanded the Roman army in the Latin War (B.C. 337), and just before a battle was fought near Vesuvius, he had a vision and was told that the army of one side and the general of the other were devoted to the gods of the dead. Accordingly, Decius Mus exposed himself to the attack of the enemy and lost his own life that the hostile army might be destroyed. The son found himself in a similar position against the Gauls at the battle of Sentinum (B.C. 295), when his heroic death gave the victory to the Romans; and again the grandson was said to have lost his life voluntarily for the same cause at the battle of Asculum (B.C. 279), in the war with Pyrrhus.

DE CIVITATE DEI, dē sĭv′ĭ-tä′tē dē′ĭ. See AUGUSTINE, SAINT.

DECK. The flooring or platform formed by covering the deck beams with steel or planking. The term is sometimes used to express the space above a deck to the under side of the next higher deck. In old type rigged men-of-war the upper deck was called the *spar deck;* the next deck, the *gun deck*—if guns were carried on it—if not, it was called the *berth deck;* the next deck below the berth deck was the *orlop deck.* In old three-deckers (i.e. wooden line-of-battle ships carrying guns on *three covered* decks) these were called the *main, middle,* and *lower* decks. The *half-deck,* in vessels having one or more covered gun decks, was that portion of the next deck below the spar deck extending from the mainmast to the cabin bulkheads. The *quarter-deck* was the part of the upper deck which was abaft the mainmast. These terms, *quarter* and *half,* were derived from the character of the decks in the days of high castle-like poops and forecastles.

The *half-deck* then extended half the length of the ship or less, the *quarter-deck* being still shorter. The after partial decks were connected with similar partial ones forward by gangways or narrow walks inside the ship's rail. As time went on, the forecastle became reduced in height and the partial decks became fewer in number, but the quarter-deck was only a partial one until after the beginning of the nineteenth century. For a long time the only partial decks above the upper, or spar, deck were those of the poop and topgallant forecastle, but the advent of the modern ship with its high central superstructure changed this together with the entire deck nomenclature. In ships of the United States Navy the highest deck which extends the full length of the ship is called the *main deck;* a partial deck above this is called the *upper deck;* above this are the *bridge decks,* bridges, etc. The first deck below the main is called the *gun deck* if any of the main battery guns are mounted on it; the next deck below the gun deck is the *berth deck;* if there is no gun deck it is the next one below the main deck; the *orlop deck* is the next below the berth deck; and then the *platform decks.* The *topgallant forecastle deck* is the deck over a raised, or topgallant, forecastle; the *poop deck* is the deck over the poop. The deck over superstructures is called the *superstructure deck, hurricane deck, boat deck, texas,* etc., according to the character of the vessel. A *flush deck* is one that extends from bow to stern without a break. A *protective deck* (fitted in men-of-war only) is one designed to protect the vitals of a ship from being struck by a shell or injured by fragments of one which bursts on board. If flat and laid over the upper edges of an armor belt, it is frequently called the *armor deck.* The ordinary type of protective decks consists of a flat portion amidships and sloping parts at the sides. The side slope may be a curve, a straight slope, or two short straight slopes; the inclination downward is at an angle of 30° to 45° and the lower edge of the deck where it meets the ship's side is several feet under water, in order that a projectile shall not get underneath it when the ship is rolling. Both the flat and sloping parts of protective decks are armored, the latter much more heavily, reaching a thickness of six inches in large protected and armored cruisers.

DECK, Théodore (1823-91). A French ceramist, born at Gebweiler, Alsace. After studying physics and chemistry, he made an extensive tour through central Europe, and subsequently became director of a factory of faïence-ware in Paris, where he conducted independent experiments in ceramics. After several years he succeeded in reproducing not only the famous faïence of Oiron, but also fine specimens of Persian and Chinese ware, such as Céladon. During the last three years of his life he was director of the factory at Sèvres.

DECK'EN, Auguste von der (1828—). A German novelist, known under the pen-name of Auguste von der Elbe. She was born at Bleckede. Her novels, several of which enjoy great popularity, include: *Chronika eines fahrenden Schülers,* which has passed through seven editions; *Onkel Wilhelms Gäste* (1899); *Seekönigs Töchter* (1900); and *Ehrgeiz* (1903).

DECK'EN, Karl Klaus von der (1833-65). A German African explorer, born at Kotzen, Brandenburg. He was for a time in the military service of Hanover, and in 1861, in company with Thornton, an English geologist undertook a journey of African exploration from Mombasa to the volcanic mountain of Kilimanjaro. In 1862 he ascended the mountain to a height of over 14,000 feet, and in the following year made an extended voyage about the African coast. His final explorations were begun in February, 1865. With a large and well-equipped expedition he attempted the ascent of the Juba River, but by reason of unnavigable rapids, was forced to take the land, and on October 2d, was murdered by the Somali at Berbera. Despite the hostility of the natives, most of his companions succeeded in reaching Zanzibar. The scientific collections of the expedition were presented to the University of Berlin, and its results were described by Kersten and others in *Karl Klaus von der Deckens Reisen in Ostafrika 1859-65* (4 vols., 1869-79).

DECK'ER, Karl von (1784-1844). A Prussian general and author, born in Berlin. He took a prominent part in the campaigns of 1813-15. He was a director in the Prussian Topographical Bureau, and for many years a lecturer at the General Military Academy. By his incessant activity and his numerous works, he greatly stimulated the interest in, and the extension of, a scientific military education, and this he accomplished in the face of serious opposition. His theories on artillery were attacked by his countrymen, but the principle of the offensive which he strongly advocated found effective illustration in the campaign of 1870-71. His works include *Der kleine Krieg* (4th ed. 1844) and *Taktik der drei Waffen* (3d ed. 1851-54).

DECKER, Sir Matthew (1679-1749). A political economist and free-trader, born in Amsterdam, Holland. He went to London in 1702, was naturalized as an English subject in the following year, and having embarked in commerce, attained the greatest success; received a baronetcy in 1716, and three years afterwards took his seat in Parliament as member for Bishop's Castle. He sat in the House, however, only four years. His death took place March 18, 1749; the baronetcy then became extinct, and his daughters succeeded to his estates.

Decker was the reputed author of two pamphlets which appeared anonymously during his lifetime, and which ran through several editions, and provoked much acrimonious controversy. In one he proposed to raise all the public supplies from one single tax—namely, a tax upon houses. According to Decker's calculation, there were then in England, exclusive of Wales, 1,200,000 houses; of these he meant to tax only one-half, counting off 500,000 as inhabited by the working classes, and 100,000 as being uninhabited. By this means he proposed to raise an annual revenue of £6,000,000, which sum was £1,000,000 more than the expenses of the Government of that day required. The surplus was to be applied as a sinking fund for the purpose of discharging debt. The same idea is found in the second essay, which discussed England's foreign trade and the means of improving it.

DECLAMATION (Fr. *déclamation*, Lat. *declamatio*, declamation, from *declamare*, to declaim, from *de*, down + *clamare*, to shout). The art of speaking according to rules, whereby the sense of the words, as well as the feeling and sentiment, [illegible] naturally and characteristically represented. Recitation, therefore, whether spoken or sung, is subject to the laws of declamation, from which it derives its value and significance. Perfect declamation implies correctness of speech, distinctness and clearness of enunciation, and a well-toned voice. Declamation is therefore clearly of a musical nature. Declamation in music, however, differs from the declamation of speaking in that the singer must adhere to what the composer has written. The composer fixes the whole of the intonation, modulation, and phrasing, and also the *tempi* and expression, and not infrequently sacrifices the correctness of the declamation to the charm of some peculiar melodic phrase or pleasing rhythm, or a vocal musical embellishment. The truth and beauty of correct musical declamation are always endangered by a translation of the original words into another language, a work which, with the greatest care and ability, it is in many cases almost impossible to accomplish word for word, or syllable for syllable, so as to fit accurately to the accent of the music. The master-works of many great composers thus suffer much from careless translation. In earlier times attempts were made to establish declamation as a science. The ancients had a kind of note, or sign of intonation, which they placed over or under the words, possibly to decide whether the accent should be given by a high or by a low tone, and thus to regulate the modulation of the voice. That the theatrical declamation of the ancients resembled the musical recitative of the present day is generally admitted.

DECLARATION (OF., Lat. *declaratio*, from *declarare*, to make clear, from *de* + *clarus*, clear). In the criminal law of Scotland, the statement made by the prisoner before the examining magistrates. It is the duty of the magistrate to take this declaration immediately on the prisoner being brought before him. The magistrate must previously inform him that it is entirely at his own option to declare or not, but that if he chooses to do so, the declaration may be used in evidence against him on his trial. The declaration ought to contain the name, age, and designation of the prisoner, the parish and county in which the crime is said to have been committed, and all similar particulars. When completed it must be read over to the prisoner, who, if he is able to write, signs every page of it along with the magistrate. This practice of the Scotch committing magistrates is identical with that which obtains in England and America, the term 'statement' being here employed for the prisoner's declaration. See ARRAIGNMENT; CONFESSION; and consult the statutes of the various States regulating the examination of persons under arrest for crime.

DECLARATION. Under the common-law practice, the first pleading in an action, consisting of a sufficient statement, in legal form, of all the material facts constituting the plaintiff's cause of action, together with a demand for relief. The facts alleged must be sufficient to give the plaintiff a right to recover if he establishes them; otherwise the defendant may demur and get judgment in his favor. Originally, in England, it applied only to personal actions, the first pleading in causes involving real property being called a *count;* but this distinction is no longer maintained in England or the United States.

The declaration is made up of the following general parts, viz. the *title*, being the name of the court; the *venue*, or county in which the cause of action arose; the *commencement*, containing the names of the parties and the capacities in which they are joined in the action, together with a statement that the defendant has been summoned; the *body*, a statement of the facts constituting the cause of action: and a *conclusion*, or formal demand for relief at the end. The body must conform to the particular common form which is adapted to the nature of the action, but the general characteristics remain the same. It corresponds to a complaint in code practice, and a bill in equity or chancery, and statement of claim (q.v.) in England. See BILL IN EQUITY; CODE; COMMON FORMS; FORMS OF ACTION; ORIGINAL WRIT; PLEADING.

DECLARATION, DYING. A statement as to the cause of his death, made by a person who has been physically injured at the hands of another, and who has given up all hope of recovery and who does later die of that injury. Only such of his statements as he could have testified to if he had lived to go on the witness stand are allowable. The substance of what was said by the dying person may be given by a witness if he cannot remember the exact words. The reason given for allowing them is that the person injured is under a solemn sense of impending death and will have every reason for telling the exact truth as if he were under oath. As these statements must be repeated by one who was present and heard them, his character enters into the weight of the evidence, and it is for the jury to determine whether he repeats what was said accurately. The jury may also give such credence to the deceased's story as in their judgment it deserves. It is for the court to rule in the first instance whether the statements are admissible as a dying declaration. They are only admissible in a case of the prosecution for the murder or manslaughter of the person making them, and are one of the exceptions to the hearsay rule. See EVIDENCE; HEARSAY RULE.

DECLARATION or **AFFIRMATION IN LIEU OF AN OATH.** A solemn statement in court or before a judicial or legislative body, by a witness, that he will tell the whole truth in such testimony as he may be called upon to give in the matter pending. Any one who objects to taking an oath, for religious or other reasons, may, in nearly all jurisdictions to-day, thus declare or affirm that he will tell the truth, but usually an oath is administered unless the witness objects. This practice was adopted generally because at common law no witness who did not believe in a Supreme Being and who, therefore, had no sense of the obligation of an oath from that standpoint, was allowed to testify, which rule excluded much valuable testimony. Violation of such declaration or affirmation is legal perjury and the witness may be punished as if he had taken an oath. See OATH.

DECLARATION OF INDEPENDENCE, AMERICAN. A document proclaiming the independence of the thirteen English colonies in America, and finally agreed upon by the Continental Congress, July 4, 1776. Early in 1776 several delegates in Congress were directed by their constituencies to vote for independence. Such a vote would be, in some particulars, no more than a recognition of the existing state of affairs, for already there existed in several provinces a complete independence of England so far as the administrative system was concerned. As a result of advice given by the Continental Congress, Massachusetts, New Hampshire, and South Carolina had early established commonwealth organizations entirely regardless of any connection with England. This organization of commonwealth governments on a permanent basis was strongly urged by John Adams, largely as a result of whose work the Continental Congress passed the resolutions of May 10 and 15, 1776, recommending to all of the colonies the formation of independent governments. This action was generally indorsed; and gradually the various States placed themselves on record as favoring the step which had now indeed become virtually inevitable—the declaration of their absolute independence. On June 7, 1776, Richard Henry Lee moved in Congress that "these united colonies are and of right ought to be free and independent States, that they are absolved from all allegiance to the British Crown, and that all political connection between them and the State of Great Britain is and ought to be totally dissolved." This motion was seconded by John Adams, but action thereon was deferred until July 1, and the resolution was passed on the following day. Two committees were appointed (on June 10), one to prepare a declaration, and the other to draw up a plan of confederation. On the declaration committee were Jefferson, Franklin, John Adams, Roger Sherman, and R. R. Livingston. They reported June 28, but action was delayed for several days. When the declaration finally came up for consideration, it was passed unanimously on July 4, by the delegates of twelve colonies, those representing New York not voting, since they had not as yet been authorized to support the movement for independence. On July 9, however, a New York convention formally pledged that State to support the Declaration. The document was engrossed on parchment in accordance with a resolution passed by Congress on July 19, and on August 2 was signed by the fifty-three members then present. Subsequently Matthew Thornton, Elbridge Gerry, and Thomas McKean also affixed their signatures. The Declaration of Independence was drafted by Thomas Jefferson, and but very slightly changed from his copy. The document itself was assigned for safekeeping to the Department of State upon the organization of the National Government; was deposited in the Patent Office in 1841, when that office was a bureau in the Department of State; was returned to the Department of State in 1877; and in 1894, owing to the rapid fading of the text and the deterioration of the parchment, was withdrawn from exhibition and was carefully put away out of the light and air. A facsimile was made in 1823, by order of John Quincy Adams, then Secretary of State, for the original signers and their families, and it is from a copy struck from the copper plate then made that the reproduction here given was obtained,

The text of the Declaration is as follows:

THE UNANIMOUS DECLARATION OF THE THIRTEEN UNITED STATES OF AMERICA.

When, in the course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume, among the powers of the earth, the separate and equal station to which the laws of nature and of nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident—that all men are created equal; that they are endowed by their Creator with certain unalienable rights; that among these are life, liberty, and the pursuit of happiness. That to secure these rights, governments are instituted among men, deriving their just powers from the consent of the governed; that whenever any form of government becomes destructive of these ends, it is the right of the people to alter or to abolish it, and to institute a new government, laying its foundation on such principles, and organizing its powers in such form, as to them shall seem most likely to effect their safety and happiness. Prudence, indeed, will dictate that governments long established should not be changed for light and transient causes; and, accordingly, all experience hath shown, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same object, evinces a design to reduce them under absolute despotism, it is their right, it is their duty, to throw off such government, and to provide new guards for their future security. Such has been the patient sufferance of these Colonies, and such is now the necessity which constrains them to alter their former systems of government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having, in direct object, the establishment of an absolute tyranny over these States. To prove this, let facts be submitted to a candid world:

He has refused his assent to laws the most wholesome and necessary for the public good.

He has forbidden his Governors to pass laws of immediate and pressing importance, unless suspended in their operation till his assent should be obtained; and, when so suspended, he has utterly neglected to attend to them.

He has refused to pass other laws for the accommodation of large districts of people, unless those people would relinquish the right of representation in the Legislature; a right inestimable to them, and formidable to tyrants only.

He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public records, for the sole purpose of fatiguing them into compliance with his measures.

He has dissolved Representative Houses repeatedly for opposing with manly firmness his invasions on the rights of the people.

He has refused, for a long time after such dissolutions, to cause others to be elected; whereby the legislative powers, incapable of annihilation, have returned to the people at large for their exercise; the State remaining, in the meantime, exposed to all the danger of invasion from without and convulsions within.

He has endeavored to prevent the population of these States; for that purpose obstructing the laws for the naturalization of foreigners; refusing to pass others to encourage their migration hither, and raising the conditions of new appropriations of lands.

He has obstructed the administration of justice by refusing his assent to laws for establishing judiciary powers.

He has made judges dependent on his will alone, for the tenure of their offices, and the amount and payment of their salaries.

He has erected a multitude of new offices, and sent hither swarms of officers to harass our people and eat out their substance.

He has kept among us, in times of peace, standing armies, without the consent of our legislatures.

He has affected to render the military independent of, and superior to, the civil power.

He has combined, with others, to subject us to a jurisdiction foreign to our constitution, and unacknowledged by our laws, giving his assent to their acts of pretended legislation:

For quartering large bodies of armed troops among us:

For protecting them, by a mock trial, from punishment, for any murders which they should commit on the inhabitants of these States:

For cutting off our trade with all parts of the world:

For imposing taxes on us without our consent:

For depriving us, in many cases, of the benefits of trial by jury:

For transporting us beyond seas to be tried for pretended offenses:

For abolishing the free system of English laws in a neighboring province, establishing therein an arbitrary government, and enlarging its boundaries, so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies:

For taking away our charters, abolishing our most valuable laws, and altering, fundamentally, the powers of our governments:

For suspending our own legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever.

He has abdicated government here, by declaring us out of his protection, and waging war against us.

He has plundered our seas, ravaged our coasts, burnt our towns, and destroyed the lives of our people.

He is, at this time, transporting large armies of foreign mercenaries to complete the works of death, desolation, and tyranny, already begun, with circumstances of cruelty and perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the head of a civilized nation.

He has constrained our fellow-citizens, taken captive on the high seas, to bear arms against their country, to become the executioners of their friends and brethren, or to fall themselves by their hands.

He has excited domestic insurrections among us, and has endeavored to bring on the inhabitants of our frontiers, the merciless Indian savages, whose known rule of warfare is an undistinguished destruction of all ages, sexes, and conditions.

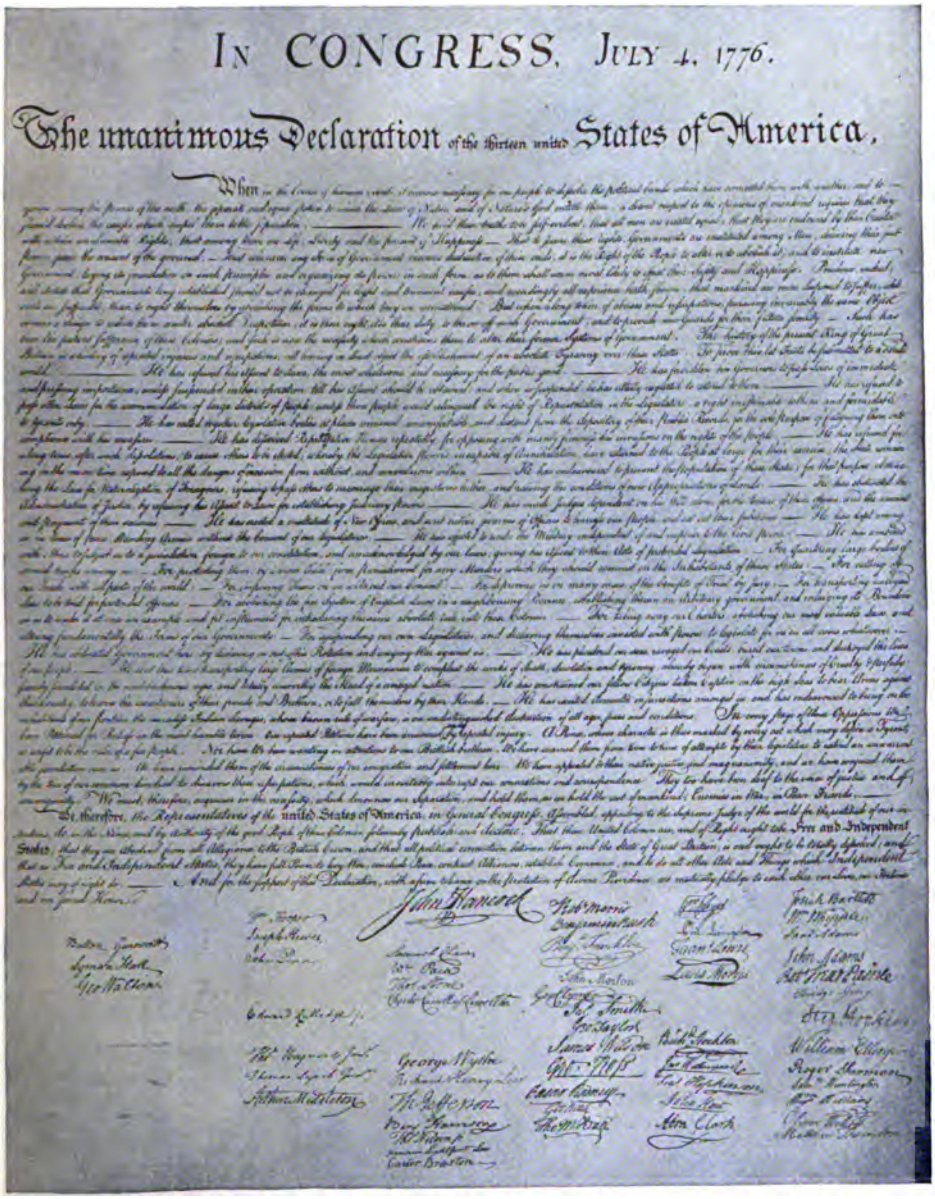
In every stage of these oppressions we have petitioned for redress in the most humble terms; our repeated petitions have been answered only by repeated injury. A prince whose character is thus marked by every act which may define a tyrant, is unfit to be the ruler of a free people.

Nor have we been wanting in attention to our British brethren. We have warned them from time to time of attempts made by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them, by the ties of our common kindred, to disavow these usurpations, which would inevitably interrupt our connection and correspondence. They, too, have been deaf to the voice of justice and consanguinity. We must, therefore, acquiesce in the necessity which denounces our separation, and hold them, as we hold the rest of mankind, enemies in war, in peace, friends.

We, therefore, the Representatives of the United States of America, in General Congress assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the name and by the authority of the good people of these Colonies, solemnly publish and declare, That these United Colonies are, and of right ought to be, *free and independent States;* that they are absolved from all allegiance to the British Crown, and that all political connection between them and the State of Great Britain is, and ought to be, totally dissolved; and that, as *free and independent States*, they have full power to levy war, conclude peace, contract alliances, establish commerce, and to do all other acts and things which *independent States* may of right do. And, for the support of this Declaration, with a firm reliance on the protection of Divine Providence, we mutually pledge to each other, our lives, our fortunes, and our sacred honor.

The fifty-six signers of the Declaration were as follows: Roger Sherman, Samuel Huntington, William Williams, and Oliver Wolcott, of Connecticut; Cæsar Rodney, George Read, and Thomas McKean, of Delaware; Button Gwinnett, Lyman Hall, and George Walton, of Georgia; Samuel Chase, William Paca, Thomas Stone, and Charles Carroll of Carrollton, of Maryland; John Hancock, Samuel Adams, John Adams, Robert Treat Paine, and Elbridge Gerry, of Massachusetts; Josiah Bartlett, William Whipple, and Matthew Thornton, of New Hampshire; Richard Stockton, John Witherspoon, Francis Hopkinson, John Hart, and Abraham Clark, of New Jersey; William Floyd, Philip Livingston, Francis Lewis, and Lewis Morris, of New York; William Hooper, Joseph Hewes, and John Penn, of North Carolina; Robert Morris, Benjamin Rush, Benjamin Franklin, John Morton, George Clymer, James Smith, George Taylor, James Wilson, and George Ross, of Pennsylvania; Stephen Hopkins and William Ellery, of Rhode Island: Edward Rutledge, Thomas Heyward, Jun., Thomas Lynch, Jun., and Arthur Middleton, of South Carolina; and George Wythe, Richard Henry Lee, Thomas Jefferson, Benjamin Harrison, Thomas Nelson, Jun., Francis Lightfoot Lee, and Carter Braxton, of Virginia.

DECLARATION OF INDEPENDENCE



IN CONGRESS, JULY 4, 1776.

The unanimous Declaration of the thirteen united States of America,

REDUCED FACSIMILE.

BIBLIOGRAPHY. Much useful material may be found in Emmet, *History of the Inception and Drafting of the Declaration of Independence; with a Collection of Autographs of the Signers, and Other Documents* (New York, 1876), which however, is not generally accessible. Consult, also: *Rise of the Republic of the United States* (Boston, 1872); Greene, *Historical View of the American Revolution* (Boston, 1865); Ellis, "The Sentiment of Independence, its Growth and Consummation," in Winsor, *Narrative and Critical History of America*, vol. vi. (Boston, 1888); Tyler, *Literary History of the American Revolution*, vol. i. (New York, 1897); Randall, *Life of Thomas Jefferson* (New York, 1858); Bancroft, *History of the United States* vol. iv. last ed. (New York, 1891); Stillé, "Pennsylvania and the Declaration of Independence," in the *Pennsylvania Magazine of History and Biography*, vol. xiii. (Philadelphia, 1889); Hays, "A Contribution to the Bibliography of the Declaration of Independence," in the *Proceedings of the American Philosophical Society* vol. xxxix. (Philadelphia, 1900); a chapter, "The Authentication of the Declaration of Independence," in Chamberlain, *John Adams, with Other Essays and Addresses* (Boston, 1898); Friedenwald, "The Declaration of Independence," in the *International Monthly*, vol. iv. (Burlington, Vt., 1901); Dana, "The Declaration of Independence," in the *Harvard Law Review*, vol. xiii. (Cambridge, 1900); and Hazelton, *Declaration of Independence: Its History* (New York, 1905). For biographies of the signers, consult: Sanderson, *Biography of the Signers of the Declaration of Independence* (9 vols., Philadelphia, 1823-27); Brotherhead, *Book of the Signers* (Philadelphia, 1861; new ed., 1875); Lossing, *Biographical Sketches of the Signers of the American Declaration of Independence* (New York, 1860); and Dwight, *Signers of the Declaration of Independence* (last ed., New York, 1895). See also the biographical notices of the individual signers.

DECLARATION OF INDEPENDENCE, MECKLENBURG. See MECKLENBURG DECLARATION OF INDEPENDENCE.

DECLARATION OF INDULGENCE. This name is applied to several acts of the last two Stuart kings, but particularly to the proclamation of James II., in 1687, suspending the operation of the penal statutes directed against the Roman Catholics and the Protestant Nonconformists, and of all acts imposing a test as a qualification for holding lay or ecclesiastical office. In this way, James hoped to gain, in favor of his Catholic policy, the adherence of the Protestant dissenters, many of whom were suffering severe persecution under those laws. Several hundred addresses of thanks were presented to the King; but the majority of the dissenting clergy would not accept toleration on such terms. The great leaders, Baxter, Howe, and Bunyan, declined the Indulgence at the price of a breach of the law and the encouragement of Romanism.

The clergy, generally, refused to read the proclamation in their churches, as commanded by a royal order of May, 1688. The seven bishops, with Archbishop Sancroft at their head, signed a firm but moderate petition to the King, refusing to publish a declaration which they knew to be illegal. James commanded the Ecclesiastical Commissioners to deprive these bishops of their sees, but this was going too far, even for that body; and on the suggestion of Jeffreys, a prosecution before the King's Bench for seditious libel was substituted. So threatening was the popular indignation, that the accused prelates were acquitted, although the jury was packed and the judges were mere tools of the Crown. The declaration cost James the allegiance of the Anglican Church, and precipitated the Revolution of 1688. Consult: Howell, *State Trials*, xii. (London, 1809-28); and D'Oyly, *Life of William Sancroft* (London, 1840). See SANCROFT.

DECLARATION OF PARIS. An agreement defining the rules of maritime law, to be applied in time of war, signed by the plenipotentiaries of Great Britain, Austria, France, Prussia, Russia, Sardinia, and Turkey, at Paris, April 16, 1856, where they had met in convention to settle the questions involved in the Crimean War, just closed. England had always claimed, and had exercised, the right to seize an enemy's goods on the high seas, though conveyed in a neutral vessel, which included the right to stop and search neutral merchant vessels for this purpose. The exercise of this right had aroused against England the Northern Maritime League of 1800, and was condemned generally by the civilized world. Nothing short of absolute command of the seas made it safe for a single power to maintain a practice which threatened in moments of danger to turn the whole body of neutral States into enemies. Besides, while it was profitable for England to seize an enemy's goods in neutral ships when she was at war, it reacted upon England when she remained at peace during hostilities between other States. Likewise, while her privateers might inflict severe injuries upon an enemy's commerce, her own commerce in time of war offered a rich field for hostile privateers. So, in return for the abolition of privateering, Great Britain consented to a rule permitting the products of a belligerent State to find a market in time of war.

The following rules were adopted by the convention: (1) Privateering is, and remains, abolished. (2) The neutral flag covers enemy's goods, with the exception of contraband of war. (3) Neutral goods, with the exception of contraband of war, are not liable to capture under the enemy's flag. (4) Blockades, in order to be binding, must be effective, that is to say, maintained by a force sufficient really to prevent access to the coast of the enemy. This declaration was subsequently accepted by the civilized nations, with the exception of the United States, Spain, Mexico, and several South American republics. The United States urged the substitution of a more advanced provision, excepting from capture all private property, even of citizens of belligerents, either by privateers or national vessels. This was the situation at the opening of the Civil War. On the issuance by the Confederate President, Jefferson Davis, of letters to privateers, Secretary of State Seward addressed a note to the Powers, requesting to be allowed to accede to the Declaration of Paris without modification. Great Britain and France, who had recognized the South as belligerents, and were anxious not to invalidate the letters of marque issued by the Confederate Government, stipulated that the accession of the United States should not "have any bearing, direct or indirect, on the internal differences now prevailing." As this placed no restriction upon Confederate privateers, the negotiations were dropped. In the war between the United States and Spain, in 1898, both belligerents formally announced their intention to adhere to the principles of the Declaration. It may be said that the second, third, and fourth principles are a recognized part of the body of international law. The question of privateering has thus far been regarded rather as one of national policy. With the development of modern navies, however, it has become of minor significance. Consult the authorities referred to under MARITIME LAW; INTERNATIONAL LAW.

DECLARATION OF WAR. A formal announcement of hostile intentions, by one State to another. It is a survival of the feudal custom of sending heralds to give the enemy warning of impending hostilities. The doctrine that notice must be given an enemy before entering upon war has never grown into an obligation, and since the middle of the eighteenth century the practice has so largely decreased that it may be concluded that a formal declaration is not required by morality or international law. The later custom of publication by a belligerent in its own territory, at the outbreak of war, of a manifesto discussing the questions at issue, and justifying its position, which should be communicated to neutrals, never has assumed the weight of an obligation, though useful both to subjects of the State and to those of neutrals.

Under conditions of modern intercourse, a State can never be taken by surprise. A period of negotiation is followed by an ultimatum in the form of a demand, refusal of which involves war. Thus, the United States demanded of Spain her withdrawal from Cuba in April, 1898, on condition of war. A later act of Declaration was passed by Congress on April 25th, fixing the date of hostilities as April 21st. This was important, as determining the date for legal purposes. On January 13, 1904, the Japanese minister delivered to the Russian government a note containing proposals relative to the matters in dispute between the two powers, a prompt reply to which was requested, the implication being that in the event of unreasonable delay, Japan would take hostile action. Formal declarations of war were issued by both governments on February 10, two days after the commencement of hostilities. When not fixed by direct notice, war is held to date from the first act of hostilities by either party. The United States began the War of 1812 by invading Canada, and seizing British vessels in port; and in 1854 the British fleet entered the Black Sea to compel the Russian fleet to return to Sebastopol before the ambassadors had withdrawn. On the other hand, the French chargé d'affaires handed a formal notice to Bismarck in 1870, and Russia declared war upon Turkey in 1877 by a formal dispatch.

DECLARATOR, ACTION OF. A form of action peculiar to the law of Scotland, the object of which is judicially to ascertain a fact, leaving its legal consequences to follow as a matter of course. The declaratory conclusions of such actions are generally followed by petitory, or possessory actions, for the purpose of giving effect to the right declared. A substantial interest on the part of the pursuer, or plaintiff, must be shown in all cases, as it is not competent to ask the court to declare a mere abstract fact or right. The existence of this special form of action has contributed to diffuse in Scotland a false view as to the nature of actions and judicial proceedings generally.

DECLENSION (Fr. *déclinaison*, Lat. *declentio*, from *declinare*, to bend, from *de*, down + **clinare*, Gk. *κλίνειν*, *klinein*, to bend, Lith. *szlýti*, to incline, Skt. *śri*, to lean). A grammatical term applied to the system of modifications called *cases*, which nouns, pronouns, and adjectives undergo in many languages. How the words declension (Lat. *declinatio*, a declining, or leaning away) and case (Lat. *casus*, a fall) came to be applied to this species of inflection, has never been made altogether clear. The relations in which one thing stands to other things may be expressed in either of two ways. Some languages make use of separate words, called prepositions; in others, the relations are expressed by changes in the termination of the name of the thing. Thus, in Latin, *reg* being the root or crude form of the word for 'king,' *regs*, or *rex*, is the word in the nominative case, signifying 'a king' as subject or agent; *regis*, in the genitive case, 'of a king;' *regi*, in the dative, 'to a king,' etc. An adjective joined to a noun usually takes a corresponding change. The number of cases is very different in different languages. The further we go back in the history of the Indo-European languages, the richer do we generally find them in these modifications. Sanskrit had eight cases, Latin six, and Greek five. The names of the Latin cases, which are often used also in regard to the English language, are the nominative, which names the subject or actor; the genitive, expressing the source whence something proceeds, or to which it belongs—it is sometimes called the adjective case; the dative, that to which something is given, or for which it is done; the accusative, the object toward which an action is directed—it completes the meaning of a transitive verb; the vocative, the person addressed or called; and the ablative, that from which something is taken. The Greek has no ablative case. The Sanskrit, in addition to the Latin cases, has an instrumental and a locative case. The grammar of the inflective languages is complicated by the circumstance that all nouns do not form their cases in the same way. This makes it necessary to distribute nouns into various classes, called 'declensions.' In Latin, as many as five declensions are usually given. (See INFLECTION.) As we descend, the case-endings become rubbed off, as it were, and prepositions are used in their stead. The languages descended from the Latin (French, Italian, etc.) have lost all the cases of nouns and adjectives. The Teutonic languages in their early periods had cases almost as numerous and perplexing as those of the Latin. German is still to a great extent incumbered with them. Modern English has only one case in nouns different from the nominative—namely, the genitive, or possessive. (See NOUN.) The declension of pronouns (q.v.) has been more persistent than that of nouns and adjectives. Languages of the agglutinative order have, in general, a great abundance of cases. In Finnish, nouns have fifteen cases, if by *case* is understood an inflectional form produced by joining on a suffix which takes the place of a preposition. Thus, *karhu*, a bear; *karhun*, of a bear; *karhuna*, as a bear; *karhutta*, without bear; *karhussa*, in the bear; *karhusta*, out of the bear, etc. In the Magyar, twenty cases may be reckoned; and the languages of the North American Indians are richer still—perhaps we should say more embarrassed. What case endings and other inflectional terminations were in their origin, as well as the comparative merits of the highly inflected and the analytic languages, will be considered under INFLECTION.

DECLINATION (Lat. *declinatio*, a bending aside, from *de*, away, from + **clinare*, to incline, bend), in astronomy. If a great circle be drawn through the pole of the heavens and any star, the declination of the star is the portion of the circle intercepted between the star and the celestial equator. The place of a point in the heavens is determined by its right ascension (q.v.) and declination, just as a point in the earth's surface is determined by its latitude and longitude.

DECLINATION. In magnetism, the angle which a vertical plane passing through the axis of a freely suspended magnetic needle when at rest makes with the true meridian or astronomical north-and-south line. The declination, which may be either to the east or west of the true north and south, varies from time to time and from point to point on the earth's surface, as do the other magnetic phenomena which are discussed under MAGNETISM, TERRESTRIAL; and under COMPASS. At some places the magnetic and astronomical meridians may coincide, while at others the difference is most marked. The following table, prepared by the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey, gives the declination or variation for January, 1902, with the annual change for the epoch 1900-05, for a number of points throughout the United States:

TABLE OF MAGNETIC DECLINATIONS

or Compass Variations for January, 1902, with the Annual Change for the Epoch 1900-05 for the Principal Places in the United States

(A plus sign indicates west declination; a minus sign east declination. For the annual change, a plus sign indicates increasing west or decreasing east declination and a minus sign the reverse.)

STATE OR TERRITORY	Station	Approximate latitude	Approximate longitude	Variation January, 1902	Annual change
Alabama	Montgomery	32° 22′	86° 18′	— 2° 40′	+3.5
	Mobile	30 42	88 03	— 4 10	+3.5
	Florence	34 48	87 43	— 3 34	+3.8
Alaska	Sitka	57 03	135 20	—29 42	0.0
	St. Paul	57 48	152 22	—24 17	+3.0
	St. Michael	63 29	162 01	—21 53	+7.0
	Fort Yukon	66 34	145 18	—34 20	+5.6
	Cape Smyth	71 18	156 39	—32 30	+2.0
Arizona	Prescott			—13 30	+2.0
	Yuma	32 44	114 37	—13 16	+1.0
	Nogales	31 20	110 56	—12 08	+2.0
Arkansas	Little Rock	34 44	92 16	— 6 34	+3.7
California	Sacramento	38 34	121 30	—16 11	+0.0
	San Francisco	37 48	122 27	—17 00	0.0
	Los Angeles	34 04	118 15	—14 27	0.0
	San Diego	32 43	117 10	—13 56	0.0
Colorado	Denver	39 45	104 54	—13 56	+3.0
Connecticut	Hartford	41 46	72 40	+10 34	+2.0
	New Haven	41 18	72 55	+ 9 51	+2.0
Delaware	Dover	39 09	75 31	+ 6 32	+2.8
District of Columbia	Washington	38 53	77 00	+ 5 10	+3.0
Florida	Tallahassee	30 26	84 17	— 2 14	+3.5
	Jacksonville	30 20	81 39	— 1 10	+3.4
	Key West	24 33	81 48	— 2 32	+2.7
Georgia	Atlanta	33 44	84 22	— 1 32	+3.2
	Savannah	32 05	81 05	— 0 34	+3.2
Idaho	Boise	43 37	116 12	—18 38	+1.5
Illinois	Springfield	39 50	89 39	— 4 05	+4.5
	Chicago	41 54	87 37	— 3 00	+3.4
Indian Territory	Atoka	34 24	96 05	— 7 59	+4.8
Indiana	Indianapolis	39 47	86 08	— 1 16	+4.0
	Fort Wayne	41 03	85 03	— 0 07	+4.0
Iowa	Des Moines	41 36	93 36	— 7 30	+4.4
	Dubuque	42 30	90 44	— 5 24	+3.6
Kansas	Topeka	....	....	— 9 00	+3.7
	Wichita	37 40	97 20	— 9 27	+3.7
Kentucky	Frankfort	....	....	— 1 30	+3.8
	Paducah	37 05	88 37	— 4 24	+3.9
	Louisville	38 15	85 46	— 1 16	+3.8
Louisiana	Baton Rouge	30 27	91 11	— 5 39	+3.5
	New Orleans	29 54	90 08	— 5 22	+3.5
	Shreveport	32 30	93 45	— 6 40	+1.5
Maine	Augusta	....	....	+16 00	+1.0
	Portland	43 39	70 17	+14 29	+0.3
	Eastport	44 54	66 59	+18 58	3.0
Maryland	Annapolis	38 59	76 29	+ 5 35	+3.0
	Baltimore	39 16	76 35	+ 5 40	+1.0
Massachusetts	Boston	42 22	71 04	+12 32	+2.8
	Springfield	42 06	73 32	+10 50	+4.0
Michigan	Lansing	....	....	+ 0 50	+4.5
	Detroit	42 21	83 03	+ 1 16	+5.0
	Marquette	46 33	87 22	— 1 57	+4.2
Minnesota	St. Paul	44 58	93 05	— 8 36	+5.8
	Duluth	46 46	92 04	—11 58	+3.0
Mississippi	Jackson	32 19	90 12	— 5 54	+3.5
	Oxford	34 22	89 33	— 5 29	+4.8
Missouri	Jefferson City	38 35	92 09	— 7 10	+4.1
	St. Louis	38 38	90 16	— 5 00	+4.3
	Kansas City	39 07	94 33	— 8 54	+2.0
Montana	Helena	46 37	112 02	—19 05	+4.0
Nebraska	Lincoln	40 49	96 42	—10 02	+4.0
	Omaha	41 16	95 58	— 9 22	+1.0
Nevada	Carson City	39 10	119 46	—16 36	+1.0
	Eureka	39 31	115 58	—16 21	+2.5
New Hampshire	Concord	43 12	71 29	+12 29	+2.0
New Jersey	Trenton	40 13	74 44	+ 8 30	+2.7
New Mexico	Sante Fe	35 41	105 57	—12 29	+2.6
New York	Albany	42 40	73 45	+10 58	+2.9
	New York	40 43	74 00	+ 9 12	+3.9
	Ithaca	42 27	76 29	+ 7 10	+3.2
	Buffalo	42 55	78 54	+ 6 07	+2.4
North Carolina	Raleigh	35 47	78 38	+ 2 34	+2.8
	Wilmington	34 13	77 56	+ 1 59	+3.8
North Dakota	Bismarck	46 48	100 47	—14 33	+4.7
	Pembina	48 58	97 14	—10 55	+3.8
Ohio	Columbus	40 00	83 00	+ 0 49	+3.7
	Cleveland	41 30	81 42	+ 3 15	+3.7
	Cincinnati	39 08	84 25	— 0 58	+3.7
Oklahoma	Guthrie	....	....	— 9 00	+0.3
Oregon	Portland	45 31	122 41	—22 24	3.0
Pennsylvania	Harrisburg	40 16	76 53	+ 6 26	+2.0
	Philadelphia	39 58	75 10	+ 7 30	+3.9
	Allegheny	40 28	80 01	+ 3 58	+1.4
Rhode Island	Providence	41 50	71 24	+11 48	+3.8
South Carolina	Columbia	34 00	81 02	— 0 07	+3.1
	Charleston	32 47	79 56	+ 0 40	+3.0
South Dakota	Pierre	44 22	100 22	—12 24	+3.6
	Yankton	42 53	97 25	—10 49	+3.8
Tennessee	Nashville	36 09	86 48	— 3 43	+3.6
	Knoxville	35 58	83 55	+ 0 06	+3.8
	Memphis	35 08	90 03	— 5 24	+3.3
Texas	Austin	30 17	97 44	— 8 05	+3.0
	San Antonio	29 27	98 28	— 8 20	+3.1
	Houston	29 42	95 20	— 7 18	+3.3
	Galveston	29 18	94 47	— 6 58	+2.3
	El Paso	31 46	106 29	—11 28	+2.7
Utah	Salt Lake	40 46	111 54	—16 06	+2.0
	Ogden	41 13	112 00	—17 00	+2.0
Vermont	Montpelier	44 15	72 32	+13 56	+2.0
	Burlington	44 28	73 12	+12 38	+2.8
Virginia	Richmond	37 32	77 26	+ 3 45	+2.7
	Norfolk	36 52	76 17	+ 4 31	+3.1
	Lynchburg	37 25	79 09	+ 2 25	+0.0
Washington	Olympia	47 02	122 54	—22 44	1.0
	Walla Walla	46 04	118 21	—21 06	+3.4
West Virginia	Charleston	38 21	81 38	+ 2 12	+3.4
	Wheeling	40 03	80 44	+ 1 13	+5.0
Wisconsin	Madison	43 04	89 25	— 4 47	+5.0

STATE OR TERRITORY	Station	Approximate latitude	Approximate longitude	Variation January, 1902	Annual change
Wisconsin	Milwaukee	43 04	87 53	— 3 18	+5.0
	Superior City	46 40	92 04	— 8 03	+2.8
Wyoming	Cheyenne	41 06	104 49	—14 24	+3.0
Cuba	Havana	23 08	82 22	— 3 05	+2.5
	Santiago	20 00	75 50	— 1 50	+2.0
Porto Rico	San Juan	18 28	66 08	+ 1 04	+2.5
	Ponce	18 01	66 36	+ 0 52	+1.0
Hawaiian Islands	Honolulu	21 18	157 52	—10 26	—1.5
	Waimea	20 02	155 38	— 9 20	—6.0
Philippines	Manila	14 35	120 58 (East)	— 0 53	—

See Compass; Dipping Needle; Magnetism, Terrestrial. Under the latter will be found charts showing the isoclinic and isogonic lines. Consult the Reports, Bulletins, and Charts published from time to time by the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey.

DECLINATION NEEDLE. An instrument for determining magnetic declination. In this instrument, which is also known as a declinometer, there are two things essential—the means of ascertaining the astronomical meridian, and a needle for showing the magnetic meridian. The common form of declinometer consists of a tripod, provided with leveling screws, and supporting a pillar, on which is fixed in a horizontal plane a graduated circle. A compass-box with vernier attached is placed on this divided circle and is free to move about a pivot at the top of the pillar. Two uprights are fixed to the side of the compass-box, on which rests the axis of a telescope. A graduated arc is fixed to the bottom of the uprights, and the angle of elevation of the telescope is read with a vernier on the arm attached to the axis of the telescope. A level is also hung on the axis of the telescope, for adjusting the instrument. Inside the compass-box is another graduated circle, the line joining the zero-points of which is parallel to the axis of the telescope. All the fittings are of brass or copper, iron, of course, being unsuitable. The compass-box and telescope move round as one piece on an axis passing through the centre of the divided circle. When an observation is made, the telescope is pointed at a star whose position with regard to the astronomical meridian is known at the time of observation. The telescope with the compass-box is then revolved the proper number of degrees until its axis is in the meridian of the place. If, when the telescope is in this position, the north end of the needle stands at the zero-point of the inner circle, the declination would be 0 = zero; but if it lie east or west, the declination is shown by the degree at which the needle stands. It is difficult to construct a needle so that the line joining its poles exactly coincides with the line joining its visible extremities. If this coincidence be not perfect, the geometrical axis of the needle, according to which the reading is made, lies to the right or left of the magnetic axis, and consequently of the true reading. To remedy this, the needle is so made that it can rest either on its lower or upper surface. In finding the true reading, the position of the needle is marked, and then it is turned upside down, and again marked, the mean of the two readings giving the true one. The most accurate method of determining declination is with the magnetometer (q.v.), and theodolite. This instrument is employed by the Division of Terrestrial Magnetism of the United States Coast and Geodetic Survey, and the apparatus and results are described in the annual reports. The declination of the needle may be also ascertained by the 'dipping needle' (q.v.). The ordinary surveyor's compass, which must be used by making allowance for declination, is a declination compass. See Compass; Engineering Instruments; Magnetism, Terrestrial; and Magnetometer.

DECLINE AND FALL OF THE ROMAN EMPIRE. A celebrated work by Edward Gibbon (1776-88), the first real attempt at scientific history in English. It contains an account of the growth of Christianity, which subjected the author to fierce attacks by the leading Churchmen of his day.

DECOCTION (Lat. *decoctio*, a boiling down, decoction, from *de*, down + *coquere*, to cook, boil). The term applied in pharmacy to a solution procured by boiling an organic drug in water. One hundred cubic centimeters of a decoction usually contain five grams of drug.

DECOMPOSITION (Fr. *décomposition*, from Lat. *de*, down, away + *componere*, to put together, join, unite). A term employed to signify the breaking up of compounds into simpler compounds or altogether into their chemical elements. The number of substances that are being decomposed is as a rule smaller, of course, than the number of substances produced by the decomposition. However, in the class of chemical transformations known as 'double decompositions,' the number remains unchanged. Thus, AB and CD, two compounds, made up each of two elements, may, on being brought into contact, undergo decomposition, the result of which would be again only two compounds, AC and BD. Examples of this class of reactions are very numerous in chemistry. But the term decomposition, unqualified, is generally applied, as stated above, to transformations involving an increase in the number of substances. Such decompositions are usually caused by the influence of some physical factor, such as heat, electricity, etc. ***Heat*** is one of the most common of decomposing agents; mercuric oxide (HgO), when heated, breaks up into the invisible gas oxygen (O_2) and the liquid metal mercury (Hg); limestone ($CaCO_3$) decomposes into quicklime (oxide of calcium, CaO), and carbon dioxide (CO_2); coal and wood decompose into a great variety of useful materials, including charcoal, illuminating gas, and coal-tar. ***Electricity*** is a potent decomposing agent; under its influence, water (H_2O) is broken up into oxygen (O_2) and hydrogen (H_2), and metallic salts are broken up into their constituent metals and acids, electrolytic processes being consequently much used both for scientific and industrial purposes. ***Light*** effects many decompositions, as of the silver salts used in photography, of nitric acid, of hydrogen peroxide, and a number of other substances. ***Percussion*** explodes nitroglycerin, and even a touch causes iodide of nitrogen to decompose violently. ***Ferments*** (minute vegetable and animal organisms) cause many decompositions, such as the breaking up of dextrose ($C_6H_{12}O_6$), in the presence of yeast, into alcohol

(C_2H_5OH) and carbon dioxide (CO_2), and the common decompositions known as putrefaction and decay.

In modern theoretical chemistry, a number of decompositions have been classed as chemical 'dissociations.' The difference between a decomposition proper and a dissociation may be understood from the following examples. When sal ammoniac (ammonium chloride) is heated in a closed vessel, it partly breaks up into ammonia gas and hydrochloric acid, and partly remains unchanged. On the contrary, if equal volumes of ammonia gas and hydrochloric acid were confined in a closed vessel at the same temperature and under the same pressure as in the first experiment, the two substances would partly combine chemically into ammonium chloride and partly remain in a state of mechanical mixture. Quantitative investigation would show that the ratio of the combined to the uncombined products is the same in both experiments, i.e the final state is the same, whether we start with sal ammoniac or with ammonia and hydrochloric acid. The decomposition of sal ammoniac is therefore called a reversible reaction and is classed as a chemical dissociation. Consider now the case of ammonia alone. Under the influence of electric sparks, ammonia breaks up, at elevated temperatures, into its elements, nitrogen and hydrogen. But these cannot by any means be caused to re-combine into ammonia. The breaking up of ammonia is therefore called a non-reversible reaction and is classed as a true decomposition. Now, the principles of thermodynamics, combined with the study of a large number of reversible reactions, led to the conclusion that two changes of an opposite character are involved in every chemical reaction whatever, and that the final state of equilibrium is determined by the relative speeds with which the two changes take place. In the case of sal ammoniac this is almost self-evident. In that case the final state, as expressed by the ratio of the dissociated and undissociated products, depends on nothing but the two speeds: viz. that with which, under a given pressure, the sal ammoniac is capable of dissociating, and that with which the products of dissociation are capable of re-combining; it was seen above that the ratio remains the same whether we start with sal ammoniac or with equivalent amounts of ammonia gas and hydrochloric acid. Further, the state of equilibrium is described as *dynamic*, not static. In other words, action is supposed to go on even after the state of equilibrium has been reached: only, under the conditions of pressure prevailing in that state, the speed of dissociation is equal to the speed of re-combination. In other words, while some amount of sal ammoniac is being broken up into ammonia and hydrochloric acid, a precisely equivalent amount of these is re-combining into sal ammoniac, and hence no change can be actually observed, although the two reactions are taking place continually. These principles, being deduced from the laws of so absolutely general a science as thermodynamics, must of course hold good in all cases without exception. When they are applied to cases of true decomposition, i.e. cases in which the reaction seems to take place only in one direction, the inference must necessarily be drawn that in those cases, too, both of the opposite reactions really take place simultaneously; only the speed of one of the reactions is so much greater than that of the opposite reaction that the amount of the product of re-combination, found after the state of equilibrium has been reached, is practically nothing. In the case of ammonia decomposed by electric sparks, the process is found to be complete and incapable of being reversed only because the amount of ammonia is so small compared to the amount of nitrogen and oxygen formed, that it can hardly be detected by the ordinary tests. It must, therefore, be remembered that while it is convenient, for certain purposes, to distinguish between the processes of decomposition and dissociation, the two kinds of processes are really identical in their nature. See also DISSOCIATION; REACTION.

DE CONINCK, de kô′năɴk′, PIERRE LOUIS JOSEPH (1828—). A French genre painter, born at Meteren (Nord). He studied in Paris under Léon Cogniet and won the second prix de Rome in 1855. He was awarded medals in the salons of 1866 and 1868, and a second-class medal at the Paris Exposition of 1889. Among his pictures are "The Trappist" (1885) and "At the Fountain," in the Wolfe collection at the Metropolitan Museum in New York City. In 1887 he was made a member of the Legion of Honor. His pictures are animated and good in color.

DE CONSOLATIONE PHILOSOPHIÆ, de kŏn′sô-lā′shĭ-ŏ′nē fĭl′ô-sŏ′fĭ-ē (Lat., on the consolation of philosophy). A philosophical work interspersed with verse by Boëthius, written about 525, in prison. Alfred the Great translated it into Anglo-Saxon, and Chaucer translated it into English before 1382. Caxton printed it in 1480. Its influence in spreading Platonic thought in the Middle Ages is almost incalculable. It was one of Dante's great thought-sources.

DECO′RAH. A city and county-seat of Winneshiek County, Iowa, 110 miles northwest of Dubuque; on the Iowa River, and on the Chicago, Milwaukee and Saint Paul and Rock Island railroads (Map: Iowa, F 1). It is the seat of Luther College and Decorah Institute. The city has stock-raising, farming, and milling interests, and manufactures of paper, tow, wagons, etc. Settled in 1849, Decorah was incorporated as a town in 1857, and was chartered as a city in 1871. Its government is administered under a general law by a mayor elected biennially and a city council. The city owns and operates its water-works. Population, in 1890, 2801; in 1900, 3246; in 1905, 3918.

DECORATED STYLE OF GOTHIC ARCHITECTURE. The style of architecture in England immediately following the Early English style (q.v.). During the reigns of the first three Edwards, from about 1280 to 1380, Gothic architecture may be said to have been in full bloom in England. It arose so gradually out of the style which preceded it, and merged so gradually into that which followed it, that it is not wonderful that different periods of duration should be assigned to it by different writers. In fixing on the middle of the fourteenth century as its highest point, however, they are all pretty much agreed, and the same agreement is exhibited in recognizing it as the most perfect of the English Gothic styles, although Moore, in *Gothic Architecture*, does not allow any perfectly national English Gothic until the Perpendicular (q.v.). This middle period of English Gothic corresponds to the earlier developed Gothic of France, represented by such buildings as Amiens, Rheims, Saint Denis, etc., and it is the sanest and best balanced English style. Certain characteristics of Norman work retained in the Early English style, such as large triforium galleries, heavy moldings, broad unbroken wall spaces, are strongly modified in the effort to attain greater lightness and richer decoration, while others, like the zigzag, are totally abandoned. The single or grouped lancet windows are largely replaced by broader windows with mullions and tracery. Consult the bibliography given under the title EARLY ENGLISH.

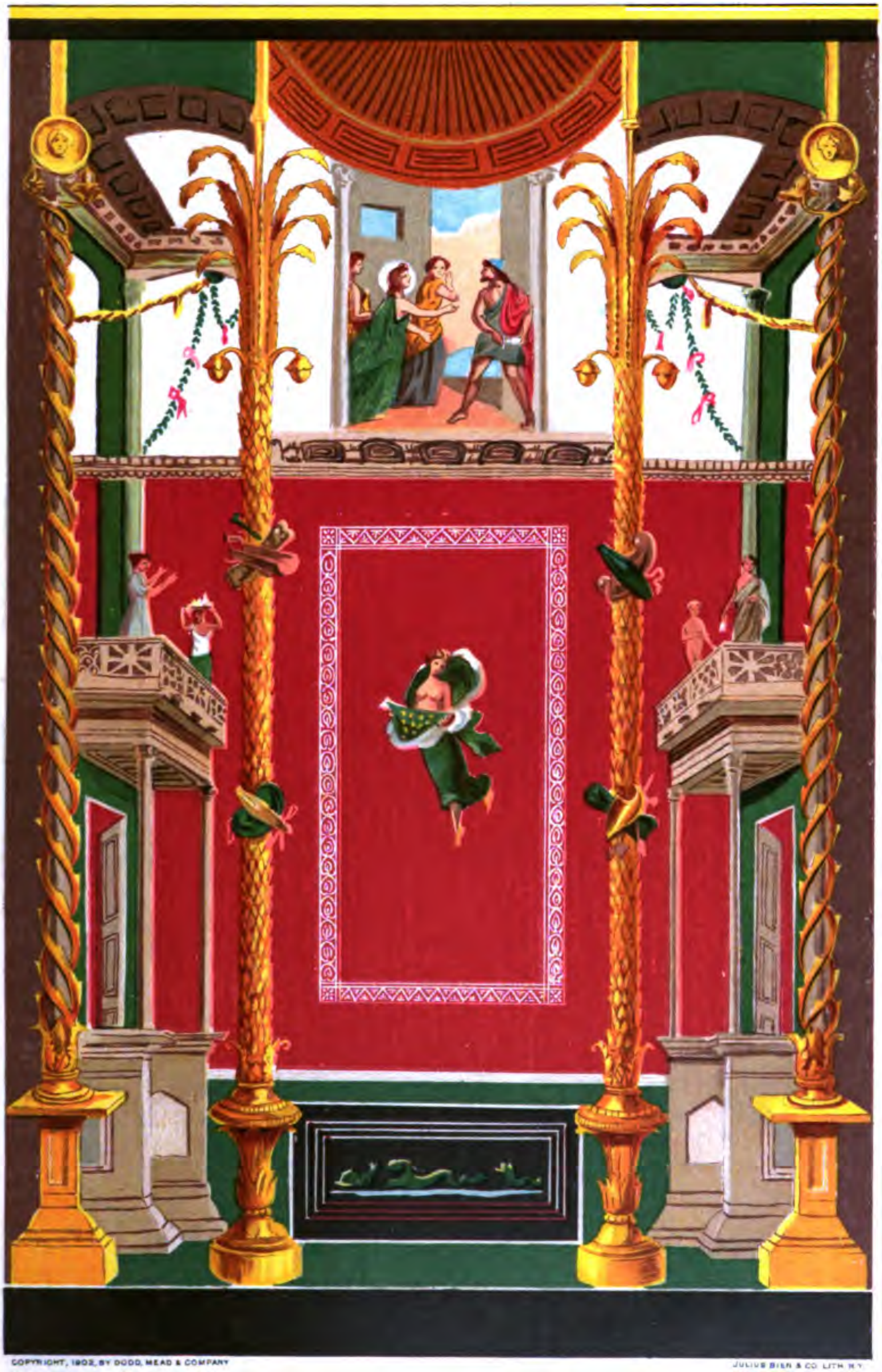
DECORATION DAY, or MEMORIAL DAY. A day (May 30) set apart each year by the various Northern States for the purpose of decorating the graves in the national cemeteries and of commemorating the soldiers who during the Civil War lost their lives for the Union cause. It is a legal holiday in all the States and Territories of the Union except Alabama, Florida, Georgia, Idaho, Louisiana, Mississippi, North Carolina, South Carolina, Texas, and Virginia. Some of the Southern States have also set apart a day for the commemoration of the Confederate soldiers who fell during the war.

DECORATIVE ART. Art in general may be defined as the interpretation of sentiment through form and color. Poetry and music, which express sentiment through sound-forms, painting, which employs color, and sculpture and architecture, which employ plastic forms, are all independent arts, producing works which have intrinsic artistic value apart from their use or environment. The term *decorative art* is applied to that subordinate phase of artistic design in form and color which has for its purpose the beautifying of objects primarily useful, by such modifications of their form, surface, or color as shall introduce new elements of harmony, rhythm, balance, and contrast pleasing to the eye and mind. In each of the independent fine arts these elements of decorative effect, although present, are incidental to the higher artistic purpose of the work. In decorative art these elements become supreme, although the object into which they are introduced or to which they are applied is itself independently complete without them. A vase, chair, blank wall, or temple pediment may perform its primary function while still unadorned by the decorator. Architecture combines the characteristics of both the independent and decorative arts; it is a combination of the useful art of construction with the decorative art of ornamental structural design. Painting and sculpture, ordinarily independent arts, may be employed to decorate buildings; and in proportion as they are subordinated to the structure they adorn, they take their place among the decorative rather than the independent arts.

DECORATIVE PAINTING. The decorative arts may be classified in various ways. The broadest division is that between decorative painting and sculpture applied to buildings on the one hand and what is technically known as ornament on the other. The art of decorative painting has for its object the adornment of certain defined spaces on the walls and ceilings or vaults of buildings by paintings, which serve the double purpose of pictorial representation—allegorical, historical, religious, or other—and of embellishing a surface otherwise bare and uninteresting. In Egypt, walls and columns, internal and external, were covered with pictures deeply incised by the chisel and richly painted. The Romans covered the walls of their chambers, courts, and banquet rooms with painted decorations in which pictures of mythological beings and of familiar scenes were mingled with landscape and fantastic architecture. (See POMPEII.) The Byzantine artists adorned the walls and apses of their churches with highly decorative pictures on a gold ground, executed often in glass mosaic: in these the drawing and coloring, forsaking the pursuit of natural realism, were controlled by purely decorative considerations. The greatest schools of decorative painting were those which grew up in Italy in the fourteenth and sixteenth centuries, the earlier having its chief centre in Florence, with Giotto as its greatest master, the second reaching its highest development in Rome between 1515 and 1560 under Raphael and Michelangelo, and a little later in Venice, where Titian, Tintoretto, and Paolo Veronese attained an extraordinary pitch of sensuous splendor of color. But no decorative painter of any age ever equaled the sublimity of conception and grandeur of execution of Michelangelo's decorations for the vault of the Sistine Chapel in the Vatican at Rome. In modern decorative painting the French are the leaders; in the United States in recent years the art has found opportunity for a great development. (See MURAL DECORATION.) Lack of space forbids enlarging further on this phase of decorative art; the inquirer is referred to textbooks on painting and to the articles on the great artists in this Encyclopædia.

DECORATIVE SCULPTURE. The work of the sculptors has in all ages been considered an essential adjunct to noble architecture. In Egypt he coöperated with the painter in producing the pictures already mentioned and carved the effigies of the King and of the god Osiris against the pylons and piers of the temples. It was, however, the Greeks who lifted decorative sculpture out of the trammels of sacerdotal tradition and exalted it into one of the highest and noblest of all forms of expression of religious and national aspirations. The friezes, metopes, and pediment groups of their temples were not merely unequaled as sculpture, but superb as decorations for the architecture to which they were affixed. In creating them, the sculptor, while he sought to embody the poetic and patriotic ideals of the Greek mythology which inspired him, was at the same time solicitous so to dispose the masses of light and shade, so to combine and arrange every outline and detail of the composition, that they should harmonize with the dominant lines of the architecture and produce that pleasing effect of harmony, rhythm, balance, and contrast which is the chief source of an enjoyment of all decorative design. The Romans made far less use of decorative sculpture than the Greeks, but developed a remarkable system of ornamental carving in relief, in which symbolic figures, grotesque, and conventional foliage were blended in a manner to enrich with a wonderful play of light and shade the friezes, pilasters, and panels to which they were applied. In the Middle Ages the builders of abbeys and cathedrals in Europe, especially in France, adorned their buildings with sculpture, both of figures and of symbolic grotesques, everywhere pervaded with religious meaning, but marvelously adapted to the exigencies of the architec-

POMPEIAN MURAL DECORATION



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

ture. Beautiful as are many of the French fourteenth-century statues of saints, martyrs, and apostles, and the ranges of seated angel choirs in the cathedral porches, considered as pure sculpture, they are perfect only when seen in the architectural setting for which they were designed, whose lines they emphasize and whose beauty they enhance. The French and Italians may be said to vie with each other for the supremacy in sculpture during the Renaissance; but while the French produced no one to equal Michelangelo in pure sculpture, the Italians never equaled Jean Goujon in the perfect mastery of decorative effect in figure sculpture applied to architecture. The French of to-day are perhaps less the superiors of the rest of the world in decorative sculpture than in painting. This form of art is also young in the United States, but has produced a few worthy works, and, like that of mural painting, is beginning to receive the recognition which it deserves as an adjunct to architecture.

ORNAMENT. When the decorative artist seeks to produce his effect not by recourse to the representative arts of painting and sculpture, but by the harmony, rhythm, balance, and contrast of lines, lights and shades, and colors, dissociated from pictorial purpose, his work falls into the category of ornament. Ornament may be defined as the combination of lines, colors, or forms according to a predetermined system, for decorative effect. When certain elementary forms recur again and again in a regular sequence or system. they are called *motives*, and the larger system or combination of motives is called a *pattern*. Ornament is said to be *naturalistic* when it employs forms directly derived or imitated from nature, as in rugs, wall-papers, or carpets adorned with flowers and foliage in their natural colors. It is called *conventional* when the designer makes use of purely arbitrary forms, coined in the mint of his own imagination or derived from tradition; such are the familiar Greek fret or meander, the *guilloche* or interlaced bands, and the geometric intricacies of Mohammedan ornament. But the largest proportion of ornament consists of a third and intermediate class of forms, derived from nature but subjected to modifications designed to adapt them to their purely decorative function by the suppression, exaggeration, and regularization of the natural details, and their result is called *conventionalization;* so that we may say that the largest part of all ornament consists of conventionalized natural forms. Such are all grotesques, wreaths and festoons, rosettes, acanthus-leaves, anthemions, and foliated scrolls. It is out of the question to attempt even the briefest sketch of the historic development of ornament. We can only observe that it has in almost all ages been dominated by the master-art of architecture, so that its successive styles have been parallel to those of architecture.

The highest field for the application of ornament is that of architecture; and such of its forms and developments as belong to the adornment of buildings are called *architectural* ornament. Decoration applied to movable objects is called *industrial* ornament. When the ornament is an essential part of the building or object to which it belongs—inwrought into its fabric, as it were—it is called *structural* ornament; when executed upon the surface of the completed object it is called *applied* ornament. These characterizations are also, in a measure, applicable to decorative painting and decorative sculpture similarly employed.

THE DECORATIVE ARTS. What has preceded applies to decorative art in general. But the various means and processes by which men adorn their buildings, furniture, utensils, and fabrics have given rise to a variety of distinct branches of the art, collectively known as the decorative arts. Chief of these are decorative or mural painting and decorative sculpture. Mosaic and stained glass may be considered as subdivisions of decorative painting when they deal with pictorial compositions, or of ornament when confined to conventional and conventionalized natural forms. Closely related to these are the arts of inlay and of tile decoration. All of these are chiefly subservient to architecture, and have furnished important elements of beauty in the churches of the Byzantine style (mosaic), the mediæval cathedrals (stained glass in western Europe, inlay in Italy), in Moorish buildings, and on the exteriors of Persian mosques and *medresseh* (tile-work). Closely related to sculpture are relief-carving, illustrated in the carved details of many styles—capitals, finials, crockets, carved moldings, friezes, and pilasters—and stucco-work, in which the wet plaster is modeled into patterns, as in Roman wall-decoration, Moorish 'quarry' ornament and wall fret-work, and Italian Renaissance plaster-work.

The *industrial decorative arts* are those which relate to the adornment of movable furniture, utensils, and fabrics. The four main divisions are based on the materials used. *Metal-work* includes not only decorative work in iron and bronze, but the work of the goldsmith and silversmith. *Wood-work* as a decorative art includes the designing of artistic furniture, wood-carving, and wood-inlay. or *intarsia*. *Ceramic art* comprises all the decorative work of the potter, including terra-cotta, decorative tiles, and the modeling and painting of all kinds of artistic earthenware and porcelain. Glass-work is closely related to it. *Textile decoration* comprises all decoration effected by weaving, embroidery, and needlework; all carpets, rugs, tapestries and hangings, lacework, figured stuffs, and the like. Book-binding, leather-decoration, and typographic ornament stand more or less apart from the above main divisions.

This mere enumeration suggests the extent of the field of decorative art and the impossibility of treating the divisions separately in a brief article of this character. In modern times the palm of superiority in the decorative arts belongs with the Eastern rather than the Western world. For the perfect development of decoration as distinguished from the arts of painting, sculpture, and architecture which appeal to the higher intellectual emotions, it would seem as though the most favorable conditions were found where tradition is most dominant, as among the Mohammedan nations, the people of India, and the empires of China and Japan. The more progressive Western nations, however superior in education and intellectual culture, fail to equal the decorative design of these Orientals, and produce their own best work chiefly when they follow in their footsteps.

The movement in Europe known as the 'Art Nouveau' or 'Art Moderne' illustrates the Western impatience of tradition. It is a studied effort to ignore all the so-called historic styles, and to produce the harmony, rhythm, balance, and contrast of good decoration by means of novel combinations of flowing curves and swaying lines, with occasional recourse to natural forms.

The limits of this article preclude the attempt even to sketch the general principles as well as the historic development of the decorative arts. The technical rules observed by decorators vary with the materials, purpose, and manipulations of the several arts; but all are subject to the controlling principles which underlie all good art. Order and balance, unity of style with variety of detail, rhythmic movement and subordination of details to the dominant theme are equally valid principles in poetry, ornament, and music.

The literature of decorative art is extensive, but a first-rate general treatise on its history and principles is lacking. Among the better known titles may be mentioned: J. Ward, *Historic Ornament* (London, 1897); J. Crowninshield, *Mural Painting* (Boston, 1883); F. S. Meyer, *Handbook of Ornament* (New York, 1894); Blanc, *Grammaire des arts décoratifs* (Paris, 1882); Moyaux, *Decorative Composition;* Speltz, *Styles in Ornament* (New York, 1905); Fred, *Die Wohnung und ihre Ausstattung* (Bielfeld, 1903). See Glass; Inlaying; Mosaic; Painting; Pottery; Sculpture; Stained Glasses; Textiles, etc.

DECORATIVE NEEDLEWORK. See Embroidery.

DE CORONA (Lat., On the Crown). The most famous speech of Demosthenes, and the most perfect specimen of the world's oratory. It was delivered in B.C. 330 as a reply to the famous speech of Æschines against Ctesiphon, who had secured the passage of a law authorizing the crowning of Demosthenes for his services to the State.

DECORT′, Frans. See Cort, Frans de.

DE COS′TA, Benjamin Franklin (1831-1904). An American clergyman and historian. He was born in Charlestown, Mass., graduated at the Concord (N. H.) Biblical Institute in 1856, and was rector at North Adams, Mass., from 1857 to 1858, and at Newton Lower Falls from 1858 to 1860. He served as chaplain in the Federal Army from 1861 to 1863, when he settled in New York. Here, having entered journalism, he was editor successively of the *Christian Times*, the *Episcopalian*, and the *Magazine of American History*. In 1884 he founded the White Cross Society, and afterwards helped organize the Church Temperance Society. He was rector of the Church of St. John the Evangelist in New York from 1863 to 1899, when he became a Roman Catholic. He published many valuable monographs and essays on early American history, and on local history, the most important of which are: *The Pre-Columbian Discovery of America by the Northmen* (1868); *Narrative of Events at Lake George* (1868); *The Northmen in Maine* (1870); *Columbus and the Geographers of the North* (1872); *The Fight at Diamond Island* (1872); *Hiawatha: the Story of the Iroquois Sage in Prose and Verse* (1873); *The Lost City of New England* (1877); *Verrazzano the Explorer* (1880); *Cabo de Baxos, or the Place of Cape Cod in the Old Cartology* (1891); and *Cabo de Arenas, or the Place of Sandy Hook in the Old Cartology* (1885); *Whither Goest Thou?* (1902). He also published a novel, *The Rector of Roxburgh* (1873), under the pseudonym of William Hickling.

DE COS′TER, Charles (1827-79). A Belgian author, born in Munich. For many years he occupied the chair of French literature at the military academy in Brussels. His prose epic, *La légende de Thyl Ulenspiegel* (1868), is a masterly description of Flemish life during the reign of Philip II. and the days of the Inquisition. Other interesting works are: *Légendes flamandes* (2d ed. 1861); *Contes brabançons* (1861); and *Voyage de noce* (1872).

DECOY (from *de-*, Fr., Lat. *de-*, down + *coy*, OF. *coi*, quiet, from Lat. *quietus*, still, from *quies*, repose). A contrivance for luring game into a snare or within the range of a weapon. In England for centuries 'decoys' have been contrivances for capturing as well as alluring ducks, by driving them into tunnel nets, or by catching them in a cage built on a platform on the water, into which they were enticed by feeding. To-day both these especial methods are obsolete; but the principle of the tunnel net still remains in the decoys built in the fresh-water pools near the coast, which attract the birds on their arrival from over sea. At the corners of the pool curved ditches are cut and covered with wide arched hoop-nets, gradually diminishing in size. The wild ducks are enticed to the mouth of the tunnel by live, tame ducks, trained for that purpose, who gradually lead the wild ducks into it, upon which a tame duck shows himself among the reeds momentarily, and disappears, to appear again higher up. This excites the wild ducks' curiosity, and they go on and on to a point where the keeper shows himself. Then the ducks rise on the wing. They are afraid to pass back by the man, so they go farther and farther up the netted archway, thinking that it may lead them into the open, but it leads them up to the end of the pipe, which by this time is on land, after which they are all easily caught.

In America the decoys are entirely different. They are painted wooden imitations of ducks (or other birds, as the case may be) anchored on the water in such a way, as from above, apparently to swim about. The decoys are set out in different order, according to the quarry the hunter is after, as naturally as possible. Thus, in open-water shooting for ducks, when the wind blows across, they will be displayed in two converging lines, heading into the wind. In shooting with the wind, the decoys are set out in the shape of a diamond. The gunner then retires to his blind, or into his sink-box. The ducks are effectually allured to alight, to share the good things they imagine the decoys to be enjoying, and are thereby brought within shot-range. Decoying is applicable to numerous kinds of wild fowl and waders, and to geese and other birds on land. A perfect knowledge of its possibilities is only to be acquired by long and close observation, and by mechanical skill in making the decoys.

Consult: Folkard, *Wild Fowler* (London, 1859-64-75-97); Galloway, *The Book of Duck Decoys* (London, 1886).

DECREE (Lat. *decretum*, judgment, from *decernere*, to separate one thing from another, to decide). In the Civil Law, an Imperial judgment in causes brought before the Emperor on appeal, or otherwise. These judgments were promulgated as law, and the principles enunciated in them were binding on all the courts of the Empire. See Civil Law; Corpus Juris; Decretal.

In English and American law, the judgment, or order, of a court of equity, the term "judgment" being properly restricted to the adjudication of a matter by the courts of common law. The difference between a judgment and a decree is fundamental, and springs out of the radical difference in the character of the jurisdiction exercised by the two classes of tribunals. The function of the law court is merely to decide the bare question in controversy between the litigating parties, awarding an unconditional judgment to one or the other of them. The court of equity, on the other hand, undertakes to do substantial justice between the parties as to the whole matter submitted by them, and it may make such decree, or order, as justice may require, without being confined to the award or denial of the particular remedy sought by the complainant. Accordingly, it may, before the final adjudication of the case, grant an 'interlocutory' decree, which may or may not become the 'final' decree of the court, or it may issue a conditional order, which shall become absolute or void, according as the condition is or is not complied with.

A *decree nisi* (unless) is a conditional order, to become absolute 'unless,' before the date fixed therein, good cause shall be shown to the court for vacating it. A decree for a temporary injunction, if drawn to become permanent, unless cause to the contrary be shown, is of this character. The phrase is not in common use in the United States, however, and in England it has come to be appropriated to a particular case in which a decree nisi is commonly employed, namely, in decrees for divorce not to take effect for a probationary period of six months or more, during which time any person may show cause why the decree should be vacated, and the parties reinstated in their conjugal rights.

In jurisdictions in which the law and equity systems have been merged, or in which they are administered by the same tribunals, the term judgment is often employed in a comprehensive sense to include decree; and when the law permits both legal and equitable remedies to be afforded in the same action, the judgment rendered may be both a judgment and a decree. See Divorce; Chancery; Equity; Judgment; and the authorities there referred to.

DE'CRESCEN'DO, *Ital. pron.* dā'krā-shĕn'dō (It., decreasing). In music, the reverse of crescendo (q.v.)—viz., a gradual diminishing of the sound. Like the crescendo, it is also sometimes combined with a slight ritardando, especially in descending passages. It is frequently marked thus, >.

DECRETAL (ML. *decretalis*, from Lat. *decretum*, a decree, from *decernere*, to decide). Generally, an authoritative order or decree; more specifically in ecclesiology, a letter or decision of the popes, determining some question of ecclesiastical law referred to them. For detailed classification of various collections of these decretals, see Canon Law; and for a famous collection, now universally admitted to be largely forged, Pseudo-Isidorian Decretals.

DECRE'TALISTS. Commentators on the *Decretum*, or the Decretals. See Canon Law.

DECRE'TUM OF GRA'TIAN. See Canon Law.

DECUMATES AGRI, dĕk'ū-mā'tēz ā'grī (Lat. tithe-lands). A term applied by the Romans to their possessions north of the Danube and east of the Rhine. These lands were given to the Gauls, and later to Roman veterans, in return for a tenth part of their produce.

DECU'RION (Lat. *decurio*, from *decuria*, company of ten, from *decem*, ten). The chief of a body of ten men. This name was applied especially, in the Roman cavalry service, to the commander of a troop of ten (afterwards more) horsemen. In the free municipalities of Italy, and in the provinces, the chief magistrates were often called *decuriones*.

DECUSSATION (Lat. *decussatio*, an intersecting of two lines crosswise, from *decussis*, the number ten, X, on account of its shape). In anatomy, the crossing of nervous filaments. Certain fibres of the anterior pyramids and lateral columns of the medulla oblongata are thus crossed freely from side to side, so that disease on one side of the brain often leads to paralysis on the other side of the body.

DEDEAGATCH, dā'dā-ā-găch'. A seaport town of European Turkey, in the Province of Adrianople, on the Ægean Sea, northwest of the mouth of the Maritza. Its harbor is small, but its trade is considerable. Dedeagatch has supplanted Enos (q.v.) as the port for the Maritza Valley. It is connected by rail with Constantinople, Bourgas, and Saloniki, and has steam communication with Greece. Population, about 2500.

DEDHAM, dĕd'am. A town, including three villages, and county-seat of Norfolk County, Mass., 10 miles southwest of Boston; on the Charles River, and on the New York, New Haven and Hartford Railroad (Map: Massachusetts, E 3). It is principally a residential suburb of Boston; but has manufactures of cotton and woolen goods, carpets, and pottery. The town contains the county buildings, including the court-house, a jail, and house of correction, a public library, and an Historical Society building. The government is administered by town meetings. Dedham was settled in 1635, and was called 'Contentment' until 1636, when it was incorporated as a town under its present name. The first free school in America supported by a general tax of the people was established here in 1644. Dedham is the mother town of a large number of other towns in Norfolk County. Population, 1900, 7457; 1905, 7774. Consult Mann, *Historical Annals of Dedham from 1635 to 1847* (Dedham, 1847). Eight volumes of town records (1635-1890) have been published (Dedham, 1886-94).

DEDICATION (Lat. *dedicatio*, from *dedicare*, to dedicate, from *de*, down + *dicare*, to say). In literature, the address of a book, or any literary work, to a particular person; *vide* Shakespeare's note to the Right Honorable Henry Wriothesly prefaced to *Venus and Adonis*. The custom, practiced by the ancients—*vide* Horace and Vergil—was adopted by the modern nations. In the seventeenth and eighteenth centuries books were usually dedicated to a patron, whose influence was sought by the author. They are now dedicated to relatives and friends; or, if learned, to scholars to whom the authors are indebted. Perhaps the noblest dedication in our language is Tennyson's poem to the memory of Prince Albert, prefixed to the *Idylls of the King*. For models of the lighter forms, see the volumes of the *Spectator*. Stevenson was particularly graceful in his inscriptions. The fulsome epistle of former times has been cut down to a brief formula, and many books are without dedications.

DEDICATION FEAST (Heb. *chanukkā*, Gk. *τὰ ἐγκαίνια*, *ta enkainia*, from *ἐν*, *en*, in + *καινός*, *kainos*, new, Lat. *encœnia*). An annual festival among the Jews, which originated in the Maccabæan period. In December, 168, the Jehovah Temple in Jerusalem was dedicated to the worship of Zeus Olympius (*Baal hashshamaim*, 'Lord of heaven,' which in Dan. xi. 31 appears as *Shikkuz hashshomem*, 'abomination of desolation') by order of Antiochus IV. Epiphanes, the ruler of the land. An altar to Zeus was set up on the altar of burnt offerings. When Judas Maccabæus recovered Jerusalem in B.C. 165 he purged the temple, removed the pagan altar, and put up a new one. The temple was then rededicated to Jehovah with festivities that lasted eight days. According to I. Macc. iv. 52-54, it was on the 25th of Chislev (December) that the dedication took place, on "the same day the heathen had profaned it," while I. Macc. i. 54 gives the 15th of Chislev as the day when the pagan altar was set up. It is probable that both events took place on the 25th, a day that may have been kept by both nations as a celebration of the winter solstice. This is further suggested by the manner in which the dedication feast has since been kept. Josephus (Ant. xii. 7, 7) calls it 'the feast of lights,' and the custom of placing lights at the entrance of synagogues and private houses is mentioned in Talmudic literature. The observation of the feast in memory of the deliverance of Jerusalem is enjoined upon the Egyptian Jews in the letters prefixed to II. Maccabees. Psalm xxx. was the dedication hymn. Consult Wellhausen, *Israelitische und Jüdische Geschichte* (Berlin, 1897).

DED'LOCK, Lady. The mother of Esther Summerson in Dickens's *Bleak House*. After a life of secret remorse for the one great sin of her girlhood, she dies of exposure on the grave of her former paramour, Captain Hawdon.

DEDLOCK, Sir Leicester. The husband of Lady Dedlock in Dickens's *Bleak House*, whose thoughtfulness and reverence for his wife only serve to increase her shame and fear of exposure.

DEDUCTION (Lat. *deducere*, to draw out). A particular aspect of the reasoning process; its counterpart is induction (q.v.). Many logicians have represented deduction and induction as opposed operations, but a careful attention to the movement of thought in reasoning shows that such a representation is only partially true. Deduction is the recognition of the validity of a general principle in some particular case. For instance, when heat is known to be a mode of motion, the recognition that therefore the laws of motion regulate the phenomena of heat is a deduction. Induction is the recognition of a particular phenomenon or group of phenomena as involving a general principle. For instance, when a study of the phenomena of heat leads to the recognition that they are regulated by the general laws of motion, it is said that an induction has been made. The difference is one concerning the point of departure in the psychological process of reasoning. If we begin with a knowledge of a law, and then recognize this law as obtaining in a special case, we make a deduction. If we begin with some special cases and in these cases recognize a law, we make an induction. In this sense, induction and deduction are opposed processes. But it is clear that to recognize a previously known law as controlling a new phenomenon (deduction) is only the obverse aspect of the recognition of this new phenomenon as involving that definite law (induction). Every deduction from a known principle to a new case is logically also at the same time a new induction of the general principle from the new case taken in conjunction with the old cases. Psychologically, this is not true. That is, often the process of reasoning is psychologically nothing more than the process of applying a familiar verbal predicate to a new perception or idea by virtue of some association between the two. But such a predicate cannot be justified, if it is questioned, without an explicit statement of some general principle and an indication that the object perceived or ideated comes under this principle; and if it is still further disputed whether the principle holds in this particular case, the only resource left is to make an induction from this and other similar cases to the general principle. In other words, induction is involved in every deduction, although, as a matter of psychological fact, it is not generally made with every deduction. Our psychological thought-movements are usually very elliptical when judged from the point of view of logic, but logic approves of the elliptical processes, if the omitted elements, when restored, help make a total process which is either inductive or deductive, according as it starts with the particular facts and reaches the general law or *vice versa;* and a complete logical process which psychologically runs in one direction can always be psychologically reversed without prejudice to its logical validity. Wherever an induction is justified, an obverse deduction is justifiable, and *vice versa*. 'Transcendental deduction' is a technical term in Kant's philosophy, designating a justification of the claim which *a priori* conceptions make of being applicable to any possible objects of experience. See Logic (where a bibliography is given), and Syllogism.

DEE (Lat. *Deva*, OWelsh *Dubr-Duin*, water of the goddess, Ir. *dé*, *goddess*, Corn. *duy*, Bret. *doe;* connected with Lat. *deus*, Lith. *dëvas*, OPruss. *deiwas*, Skt. *dēva*, god). A river in England and Wales, draining parts of the counties of Merioneth, Denbigh, Flint, and Shropshire, and the west of Chester (Map: Wales, C 3). It ends in a tidal estuary of the Irish Sea, 13 miles long, and 3 to 6 miles broad. From the city of Chester, which it almost encircles, a canal seven miles long connects the river with the estuary. Its course is 90 miles long, and among its chief tributaries are the Treveryn and Alwyn. Canals connect the Dee with the rivers of central England. The ancient Britons held its waters sacred.

DEE. The name of two rivers in Scotland. The larger rises in five wells, 4000 feet above the sea, in the neighborhood of Ben Macdhui (Map: Scotland, F 2). After flowing 12 miles south-southeast, it is joined by the Geauley, 1294 feet above sea-level, tumbles through a narrow chasm, called the Linn of Dee, runs east-northeast through Aberdeenshire and a small part of Kincardineshire, and ends in the North Sea at the harbor of Aberdeen. In its course of 90 miles, it receives the Lui, Muick, Feugh, etc. On its banks is Balmoral Castle. The smaller Dee rises near the northern boundary of Kirkcudbrightshire (Map: Scotland, D 5). For the first forty miles, it flows southeasterly, then westerly, falling into the Solway Firth at Kirkcudbright Bay. It is about 50 miles long and navigable for the last seven miles. The Dee is noted for its salmon, which are superior in hue and size to those of most rivers in the south of Scotland.

DEE, John (1527-1608). An English astrologer and mathematician. He was educated at Cambridge, lived for some time at the University of Louvain, and went to Paris in 1550, where, at the College of Rheims, he lectured on the *Elements* of Euclid with great success. In 1551 he returned to England, was introduced to Edward VI., and was pensioned; but during the next reign he was falsely accused of attempting Queen Mary's life, and came very near being executed. Queen Elizabeth received him kindly and promised him an appointment. This promise was not fulfilled, and Dee again set out for the Continent in 1564, ostensibly for the purpose of presenting to Emperor Maximilian a book which he had previously dedicated to him. Lilly, however, in his *Memoirs*, affirms that he acted as Queen Elizabeth's 'intelligencer' or spy. In 1594 he was made chancellor of Saint Paul's Cathedral, and in the next year warden of Manchester College. He died very poor. Dee's writings, mostly on the occult sciences, were published in London in 1659.

DEED (an act, Lat. *factum*, something done). A written instrument, sealed and delivered, whereby a legal right is created or transferred. Though the term is popularly employed only in connection with instruments for the conveyance of land, it is not, in the legal sense, thus restricted, being equally applicable to a considerable variety of other legal transactions effected by the same solemn form. A contract, an appointment to office, the surrender of a right of action, may be effected by deed, as well as the transfer of title to land or goods. In other words, it is not the event, or transaction, but the manner in which it is performed, which constitutes the deed. So, too, it is in a popular, rather than a strictly legal sense, that a sealed writing, in and by itself considered, is described as a deed. Until delivered to the party who is to have the benefit of it, it is still a mere writing, an escrow (*écrit, scriptum*), an inchoate deed. The perfected deed is compounded of three distinct things—the writing, the act of sealing, and the act of delivery.

The superior validity of a transaction effected by deed, as compared with one consummated by spoken words or by ordinary writings, is a matter of history. Blackstone declares that a deed derives its name (deed, *factum*) from the circumstance that "it is the most solemn and authentic act that a man can possibly perform with relation to the disposal of his property; and therefore a man shall always be estopped by his own deed, or not permitted to aver or prove anything in contradiction to what he has once so solemnly and deliberately avowed" (2 Bl. Com. 295). In fact, the deed is the one form in which the formal or ceremonial mode of incurring an obligation or transferring a legal right survives among us, corresponding in that respect to the *mancipatio* and the *stipulatio* of the Roman law, the latter of which still appears in the usual ceremony of marriage. Recent investigations into early legal procedure show conclusively that in primitive society a peculiar importance and validity attaches to legal transactions of the formal sort, and, though the tendency of advancing civilization is to reduce or eliminate the distinction betwen formal and informal obligations, this has never been completely accomplished. The conclusive effect of a deed is probably due to the fact that it originated at a time when writing was a rare accomplishment, confined to those who had taken holy orders, and that its character, as a solemn form of engagement, had become established before the art of writing became more general. Its superior validity still consists in the fact mentioned by Blackstone, in the passage quoted above, that he who makes a deed is conclusively bound by the statements which it contains, and that, in contracts and other transactions which ordinarily require a consideration to support them, no consideration is necessary if the transaction be consummated by deed. Technically, a contract in the form of a deed is known as a specialty.

Deeds are of two kinds, deeds poll and indentures—the former being of only one part, i. e. binding only one person or group of persons, in the same way and to the same effect; and the latter having two or more parties, who become bound to one another. Thus, the ordinary deed of conveyance, whereby A, or A and B, convey land to C, the latter entering into no engagement with reference to the transaction, and the grantor or grantors, only, executing it, is a deed poll; whereas, articles of association or of partnership, or any other bilateral contract, under seal, whereby several parties become mutually bound to one another, is an indenture. The names are derived from the circumstance that deeds of the latter sort were formerly written in duplicate, etc., on the same piece of parchment, which was then cut so as to separate them by an indented and irregular line, whereby their identity could afterwards be established. The deed poll, on the other hand, only one copy being required, was polled, i. e. shaved or cut off smooth. This difference in the form of deeds having disappeared, the term indenture is often carelessly employed in deeds which are really deeds poll. The distinction between them has not, however, been obliterated by their assimilation in form, and a deed purporting to bind only one party, or, whatever it may purport, executed by only one, is still a deed poll and binds only the giver thereof and not the person to whom it is delivered.

Deeds have from an early period been employed for the transfer of certain interests in land, but their general and almost exclusive use for this purpose is quite modern. Formerly, at common law, freehold interests in land were created or conveyed by the formal ceremony known as livery of seizin, while all estates less than freehold were subject to alienation by parol, deeds being required only to convey the class of interests known as incorporeal, such as easements, profits, future interests in land, and the like. But deeds have now, under the technical description of grants, almost entirely superseded other modes of conveyance of interests in land. Only estates for years or tenancies at will are still capable of arising by parol or by writing not under seal, and in England even leaseholds, for three years and upward, can be created or transferred only by deed. In Great Britain and most of the United States, the general use of deeds for purposes of conveyance is a matter of regulation by statute.

In form, however, the deed remains substantially the same as at common law. The writing must still be on paper or parchment, though it may to-day be done by the typewriting machine or the printing-press. The old requirement of a seal is also generally adhered to, though in a few of the Western States it has been abolished, and in most others a scroll, or similar mark made with the pen, may be substituted for the more usual wafer or sealing-wax. But, whatever its form, the important thing is not the adhesion to the paper of something called a seal, but the sealing of the instrument by the party to be bound by it. It must be 'his own act and seal.' At the present time, also, it is generally considered that the instrument must contain the name of the maker in his own handwriting, although prior to the Statute of Frauds, in 1648, signing was not necessary to the validity of deeds, and it is not clear that the statute contemplated any addition to the formalities with which they were already surrounded.

Delivery is properly accomplished by the obligated party handing over the sealed writing in person to the party to be benefited thereby. Either party may, however, be represented by an agent, and a delivery to an unauthorized third person is good if subsequently ratified by the benefited party. Indeed, it has been held that any unequivocal act on the part of the obligated party, showing an intention to vest the possession of the document in the benefited party, is sufficient to constitute a delivery, even without a manual transfer of possession to any one—as where the former, at or after the time of sealing, utters the words, 'I deliver this as my act and deed,' or where he incloses the sealed writing in an envelope, addressed to the benefited party, though retaining it in his own possession. There is some conflict of authority, however, as to whether a delivery of the latter sort, or to a third person, which, in fact, never comes to the knowledge of the party intended to be benefited, will be sustained by the courts. There may also be a conditional delivery, which is made to a third person, as an 'escrow,' or mere writing, to be delivered over to the benefited party on the performance of some act or the happening of some event. An escrow does not take effect as a deed until the delivery over, when it takes effect, by relation back, as of the time of its first delivery. See ESCROW, and the titles of the various kinds of deeds, as COVENANT; GRANT; LEASE AND RELEASE. Consult: Coke *on Littleton;* Blackstone, *Commentaries on the Laws of England;* Kent, *Commentaries on American Law;* Pollock and Maitland, *History of English Law* (2d ed., Cambridge and Boston, 1899); Holmes, *The Common Law* (Boston, 1881); and the authorities referred to under REAL PROPERTY.

DEEMS, CHARLES FORCE (1820-93). An American clergyman. He was born in Baltimore, graduated at Dickinson College in 1839, and was for some time agent in North Carolina for the American Bible Society. He was professor of logic and rhetoric in the University of North Carolina from 1842 to 1845, and held the chair of natural sciences in Randolph Macon College (Ashland, Va.) from 1845 to 1846. He then became a Methodist preacher at New Berne, and for five years was principal of the Greensboro Female College. In 1865 he went to New York, where he helped found the Church of the Stranger (undenominational), of which he became pastor. In 1881 he founded the American Institute of Christian Philosophy. Among his many publications are: *Life of Dr. Adam Clarke* (1840); *The Home Altar* (1850); *Annals of Southern Methodism* (1856); *Life of Jesus* (1872); *A Scotch Verdict in Evolution* (1886); *The Light of the Nations* (1886); *The Gospel of Common Sense as Contained in the Canonical Epistle of James* (1889); *Chips and Chunks for Every Fireside;* and *Wit, Wisdom, and Pathos* (1890); *The Gospel of Spiritual Insight, and Studies in the Gospel of John* (1891). Consult his Autobiography (New York, 1897).

DEEM'STER, DEMPSTER, *or* DOOMSTER (AS. *dôm, doom,* judgment, as in Domesday Book; hence *doomster* or *deemster,* a judge). The name of an officer formerly attached to the High Court of Justiciary in Scotland, who pronounced the doom or sentence of condemned persons. The office was held along with that of executioner. At the conclusion of a trial, this dread official was produced in open court, in presence of the wretched criminal, as is graphically described by Scott in his tale of *Old Mortality.* See notes to that work, and also notes to *Heart of Midlothian.* The office of deemster has been long abolished. In the Isle of Man and Jersey deemsters are judges, the office as well as the title being of great antiquity and dignity. The highest judicial authority in the Isle of Man is divided between two deemsters, one for the northern and the other for the southern half of the island.

DEEP RIVER. A river rising in Guilford County, N. C. (Map: North Carolina, C 2). It flows southeast and then east, and, joining the Haw River (q.v.) in Chatham County, forms the Cape Fear River (q.v.). About 120 miles long, the stream drains an area of 1350 square miles. Extensive coal and copper deposits are found in its valley. It furnishes extensive water-power at Lockville, and is navigable to Carbonton.

DEEP-SEA EXPLORATION. The depths of the sea have been explored with precision only during comparatively recent years. Deep-sea investigations began in the necessity for accurate soundings for submarine cables, and this is still the main reason for sounding, but much more has been accomplished in this field by dredging for purely scientific purposes.

The most important part of our knowledge of deep-sea conditions has been gained since 1870. The *Challenger* expedition sent out by the British Government from 1873 to 1876 (see CHALLENGER) engaged in pelagic investigations for nearly four years, sounding and dredging in the oceanic basins at more than 350 different places. This vessel was well equipped, and carried a scientific staff under the direction of Sir Wyville Thomson. A great amount of deep-sea work was accomplished, and the large series of *Reports* form the most important contribution ever made to the literature of this subject. Other extensive deep-sea investigations have been conducted at various times by most of the European governments, while vessels of the United States Coast Survey, or of the Fish Commission, have been engaged in them more or less regularly since 1870. The Prince of Monaco has made very important contributions to this department of knowledge, as he has for many years employed his yachts almost entirely in deep-sea work, and has devoted much time to the improvement of the appliances for investigation.

The methods employed by the earlier investigators for measuring the depths were slow and uncertain, for their soundings were made with hemp rope, which was greatly drifted by currents and gave inaccurate depths. The soundings and dredgings conducted on the *Challenger* were so made, and often under great difficulties. At the present time such investigations are made by means of wire, the first successful employment of which was by Sir William Thomson in 1872. Wire sinks rapidly, presents the least frictional surface, and is but little affected by currents; and the machinery is now so perfect that soundings may be made with accuracy in the greatest depths. The improved methods show that the early soundings by the *Herald*, *Congress*, and other vessels with rope, supposed to have reached over 7000 fathoms, were erroneous, and that there are probably no such depths in the ocean.

The greatest depth known was discovered by the United States cable-survey ship *Nero* in 1900, near the Island of Guam, where a sounding was made of 5269 fathoms, or nearly six statute miles, a depth sufficient to submerge the highest mountains. It is probable that future soundings will reveal slightly greater depths. For four years prior to the voyage of the *Nero* the deepest water known was north of New Zealand, where the British ship *Penguin* sounded in 5155 fathoms. Off the coast of Japan, in 1874, the United States ship *Tuscarora* found a depth of 4655 fathoms; and in 1900 the United States Fish Commission steamship *Albatross* made a sounding in the western Pacific of 4813 fathoms. Many great depths have been discovered in the Atlantic, the deepest (4561 fathoms) off Porto Rico, by the United States Coast Survey steamer *Blake*. More than forty "deeps," or depressions ranging from 3000 to 5200 fathoms, are now known, some of them mere holes, others of vast extent. The deeps are well distributed over the seas, but none have been found north of the fifty-fifth degree of latitude. The average depth of the sea is probably not less than 2200 fathoms.

METHOD OF SOUNDING. In the operation of sounding several instruments are sent down with the wire. A thermometer takes the temperature at the bottom; a closing cylinder brings up a specimen of the bottom water for analysis, and the sounding cylinder at the end of the line brings up a specimen of the bottom mud or ooze, for examination as to the character of the bottom. These instruments are all self-acting at the bottom and are not affected in rising to the surface.

To the sounding cylinder is attached the sinker—a 60-pound iron shot—which detaches itself on striking the bottom. An indicator attached to the reel on deck shows the number of fathoms of wire that have run out. After sounding the wire is reeled in by steam. It takes about one hour to make a sounding three miles deep and get the instruments back on board.

DEEP-SEA DREDGING. The methods employed on board the United States Fish Commission steamship *Albatross*, doubtless the best-equipped deep-sea dredger in existence, may be taken as illustrative. The *Albatross* has brought together larger deep-sea collections than have been made on any other vessel. She has made nearly 6000 hydrographic soundings, and nearly 2000 hauls of the dredge or beam trawl. The investigations of this vessel cover areas extending from the Banks of Newfoundland along both coasts of North and South America to Bering Sea, and also limited areas in the tropical Pacific, and in the regions between Japan and Kamchatka. Her work has carried dredging into deeper waters than ever before, animal life having been obtained near the Tonga Islands at a depth of 4173 fathoms, while the dredge on one occasion in Bering Sea brought up from a depth of 1771 fathoms more than 800 deep-sea fishes at a single haul.

The creatures of the deep sea are brought up by means of a dredge or beam trawl towed by a wire rope, operated by a powerful engine on deck. The first operation in dredging is to ascertain the depth by sounding, after which the trawl is put overboard and allowed to sink to the bottom as the dredge rope is let out. The dredge, or beam trawl, is simply an iron frame to which is attached a strong bag-shaped net about 20 feet long. The mouth of the dredge, as formed by the iron frame, is about eleven feet wide and two feet high. Dragged along the bottom, it quickly fills with animals. Sometimes it settles into mud or ooze and is very hard to lift. The dredge rope is connected with a large spring, or accumulator, attached to the foremast, which often shows the dredge to be pulling thousands of pounds. Before the dredge reaches the surface, most of the oozy mud washes away, so that the dredge haul is usually light enough to be hoisted from the water and landed on deck with safety. Sometimes it is filled with fishes; sometimes with sea-urchins, starfishes, crinoids or corals; sometimes with squids and devil-fish. It often brings up a varied collection, in which many classes of marine animals are represented. The time required by the *Albatross* in making her deepest dredge haul—that from 4173 fathoms—was ten hours, the engine reeling in the great weight of line very slowly. In depths of 1000 to 1500 fathoms hauls can be made in three or four hours, according to conditions.

In addition to the dredge, another collecting machine, very useful on rough bottom, is the 'tangle.' This consists of bunches of shredded rope attached to iron bars, and when dragged over the bottom it frequently brings up sea-urchins, starfish, and crinoids in abundance. A deep-sea fish-trap has been devised by the Prince of Monaco, in which fishes have been taken as deep as two miles. The *Albatross*, in 1897, succeeded in setting ordinary gill-nets a mile deep, and catching Macrurus and other deep-water fishes. Deep-water exploration by means of gill-nets, traps, and trawl lines promises to yield interesting results.

DEEP-SEA LIFE. The surface of the sea nearly everywhere bears an abundance of minute animal and plant life. In this surface life, or 'plankton,' as it is called collectively, many groups of invertebrates are represented. The phosphorescence often seen upon the surface of the sea is due entirely to their presence. These almost microscopic creatures are constantly dying and falling to the bottom. They constitute the principal food of the smaller animals dwelling there, and their remains form a large part of the deep-sea oozes. The most important forms among them, considered with reference to abysmal deposits, are the Globigerinidæ and the radiolarians, which are enormously abundant.

The marine deposits on the ocean floor are generally referred to three groups: Those of the continental slopes are called Terrigenous Deposits, derived from the land through the wearing action of rivers, tides, and currents. These coastwise deposits are the blue, green, coral, or volcanic muds, and are characteristic of the adjacent land slopes from which they are derived. Farther off shore, generally about 200 miles, occur the Pelagic Deposits, made up of dead marine organisms from the surface—the minute surface life already referred to: Here we find oozes, such as diatom, radiolarian, or globerina oozes which depend respectively upon the character of the surface life prevailing above them. Beyond these, in the deeper parts of the ocean, are the Red Clay Deposits, which cover about half the ocean floor. This region is not affected by matter from the land, and receives little pelagic matter from the surface. It lies so deep that the shells of surface organisms falling down are removed through the solvent action of the deep water. The red clay is believed to have formed very slowly, not more than a few feet of matter having accumulated since the Tertiary period.

INTERMEDIATE DEPTHS. The question as to the existence of life at intermediate depths has been given general reconsideration since the perfecting of closing tow-nets for the exploration of such depths. The experience gained with the various intermediate nets used on board the *Albatross* has shown no mingling of surface and bottom forms. The latter occur, of course, at all depths along the Continental slopes. See DISTRIBUTION OF ANIMALS.

From the evidence now at hand with respect to light in the sea, it seems certain that the sunlight does not extend below a couple of hundred fathoms, and even there becomes very dim. Below this the vast body of the ocean is absolutely dark, being illuminated only where phosphorescent creatures may shed a certain amount of steady or intermittent radiance (see below).

CONDITIONS AND LIFE AT GREAT DEPTHS. It is always cold at the bottom of the sea, the influence of the warm surface waters not extending below a few hundred feet. In the great depths the temperature is always close to the freezing point. In warm equatorial seas, where the depths exceed 400 fathoms the difference between surface and bottom temperatures usually ranges from 40° to 49° F. It has been found that from 100 fathoms down, or throughout the waters beyond the influence of the sun, temperatures remain practically constant. At the surface of the sea the lines of equal temperatures are parallel with the equator, although subject to deflections by currents, while at the bottom they follow the general trend of the continents. The cold water of the depths comes from regions far to the north and south of the tropics, the coldness being due to the water in polar or subpolar regions sinking and gradually spreading itself over the ocean floor. If for any reason the cold polar waters should cease to flow downward toward the deep tropical basins, the deep-sea water would rise in temperature, and deep-sea life would perish from lack of the air which the polar currents absorb at the surface and carry down with them. So far as is known, the bottom currents are extremely slow, and, as the water is not affected by storms, it is likely that the lower part of the deep sea is a place of calm repose.

There is a tremendous pressure of water in the depths; so great, in fact, that it will crush all objects that are not constructed to resist it. All deep-sea instruments are made to withstand a pressure increasing about a ton to the square inch with each 1000 fathoms of depth. At the greatest depth known there would, therefore, be a pressure of nearly six tons to each square inch of surface. The tissues of deep-sea animals are so permeated by fluids, however, that a balance is maintained, and at the bottom they may be as firm as animals of the shallow waters. Most of these creatures are so soft that when withdrawn from the pressure which keeps them in a firm condition at the bottom and brought to the surface, they must be treated carefully to prevent their going to pieces. The bones of abysmal fishes are especially cartilaginous. When deep-sea creatures are dragged to the surface from deep water they are always dead, and doubtless die during an early stage of their upward journey.

PHOSPHORESCENCE AND COLOR. It has been mentioned that no light reaches the abyssal regions, which are absolutely dark so far as sunlight is concerned; hence plant life is unknown there, and all the animals of the depths are carnivorous.

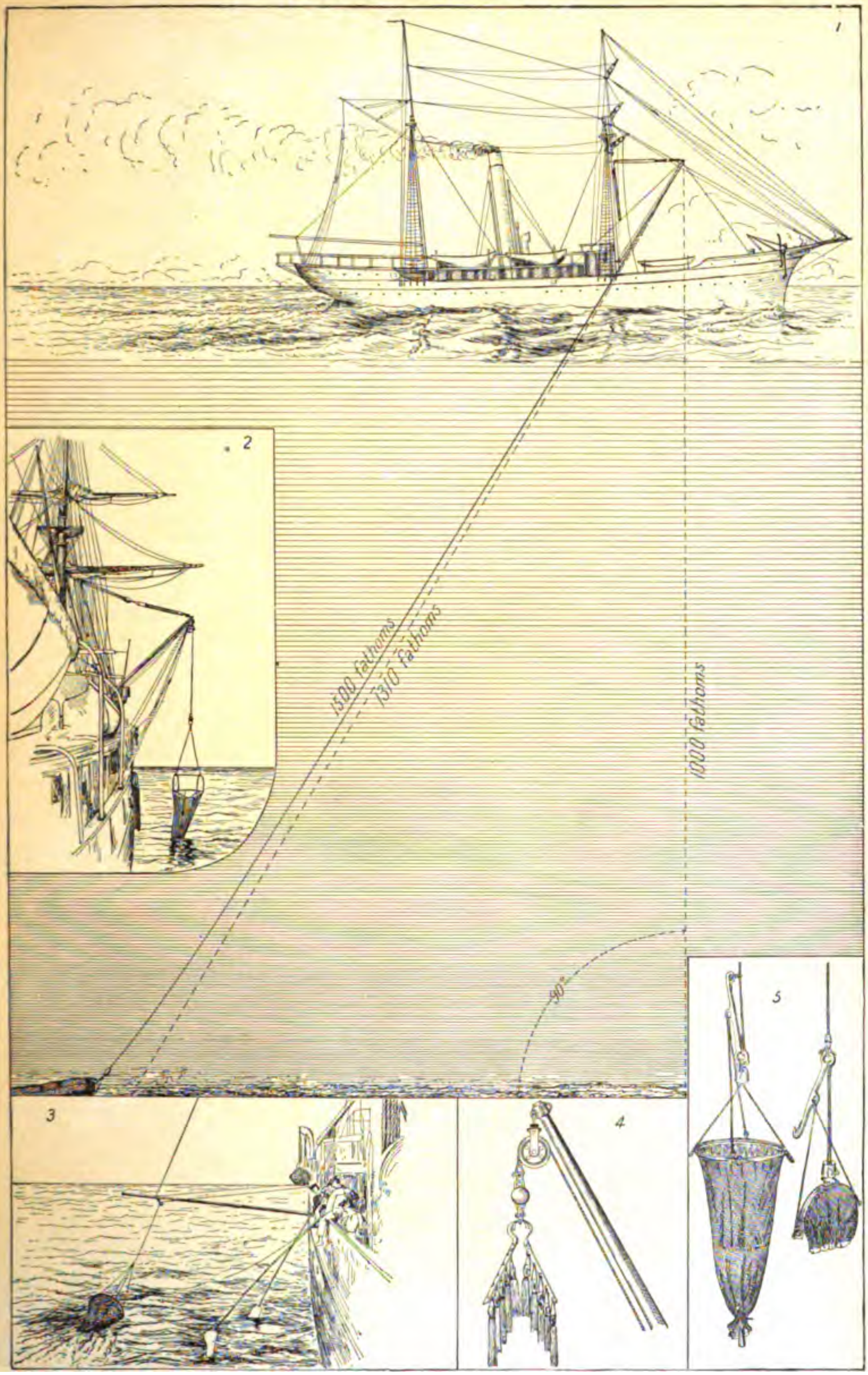
Deep-sea dredging, however, has brought up so many phosphorescent animals that there can be little doubt of considerable phosphorescent light in the depths. The amount of such light given off at the surface is no measure of that produced under normal conditions at the bottom. Phosphorescent organs take many forms in the depths, and occur in both fishes and invertebrates.

The colors of deep-sea animals are usually as brilliant as those of animals living under the influence of light, although not so varied. The reds, yellows, purples, and greens predominate, and the colors, when they occur at all, are apt to be in solid masses, in striking contrast, or the whole animal is of a uniform brilliant coloration. There is a conspicuous absence of blue. The fishes, as a rule, are dark-colored, but many of the crustaceans, holothurians, and starfish are brilliant.

EXPLANATION OF PLATE.

1. Method and theory of deep-sea dredging, as practiced on the U. S. S. *Albatross*. 2. The deep-sea dredge and its derrick. 3. Gathering the surface life, by hand nets, and by a towing net rigged to the port boom. 4. The tangles, showing its rigging. 5. The Townsend intermediate net, open and closed. Having been sunk to the depth desired, it is towed for a time and then a sliding weight is allowed to run down the line; striking the ring which holds upright the iron arm hooked to the tow-rope, it dislodges the ring and releases the arm, which falls, permitting a weight beneath it to slide down and pinch together the folding rim of the netting bag, which may then be drawn up without loss of contents.

DEEP-SEA EXPLORATION



1. U.S.S. ALBATROSS dredging.
2. THE DREDGE AND ITS RIGGING.
3. SURFACE NETTING.
4. TANGLES.
5. INTERMEDIATE SELF-CLOSING TOW-NET.

Some of the deep-sea animals are blind. Those that have eyes probably capture their prey by the phosphorescent light shed from their own bodies and the bodies of the vast number of other creatures that are constantly flashing their faint lamps over the ocean floor. Fishes of the greatest depths have the smallest eyes, while those of moderate depths have very large eyes, as, for instance, those of the Macrurus type. Many of them have highly developed organs of touch. Some of the fishes have enormous jaws, much larger proportionately than are found among shallow-water forms. Their teeth also are more formidable. See Macrurus and Plate of Codfish and Allies.

Size. All the animals that have so far been brought up from deep water have been taken in dredges of moderate size, so small, in fact, that they are only capable of taking small animals, the largest specimens of fishes seldom exceeding four or five feet in length. It is quite possible that by using larger dredges larger animals could be taken.

Conclusion and Bibliography. It will be seen from the foregoing that the fauna of the depths lives under such extraordinary conditions as temperature close to the freezing-point, pressure amounting to a ton to the square inch for each 1000 fathoms of depth, and darkness except for light due to phosphorescence.

Consult: Thomson, *Depths of the Sea* (London, 1873); Wild, *Thalassa* (London, 1874); *Reports* and *Narratives* of the *Challenger* Expedition (see Challenger Expedition); A. Agassiz, *Three Cruises of the 'Blake'* (Boston, 1888); annual *Reports*, *Bulletins*, etc., of the United States Fish Commission (Washington, 1872 onward); *Bulletins* and *Memoirs* of the Museum of Comparative Zoölogy (Cambridge, 1875 onward); Tanner, *Deep-Sea Exploration* (Washington, 1897); Townsend, *Records and Bibliography of the 'Albatross'* (Washington, 1901).

DEEP-SEA FLOUNDER. A name given locally in the North Atlantic States to both the plaice and the pole-flounder (qq.v.).

DEEP-WATER SCULPIN. See Sea-Raven.

DEEP-WATER TROUT. See Squeteague.

DEEP-WATER WHITING. See Whiting.

DEER (AS. *dēor*, wild beast, animal, Ger. *Thier*, animal, Goth. *dius*, wild beast; cf. AS. *dēor*, bold, OHG. *tiorlīh*, wild). The popular name for even-toed, hoofed mammals of the family Cervidæ and subfamily Cervinæ. The musk (q.v.), usually called musk-deer, forms a distinct subfamily, which is sometimes accorded full family rank. More than fifty species of deer are known, occurring in all parts of the world except Australia and southern Africa. Southeastern Asia especially abounds with them, some of the largest as well as many of the smallest residing there. Only two species of deer dwell in the whole continent of Africa, and both of these are near relatives of European species and occur only in the northern parts of the continent. In North America there are perhaps eight or ten species of deer, while Central and South America possess a much larger number.

Deer are characterized by the absence of a gall-bladder and the possession of upper canines, lateral digits on both fore and hind feet, a remarkable suborbital sinus or tear-pit below each eye, and antlers. Antlers are the most noticeable of these characters, though they are usually present only in the male. The female reindeer has antlers and individual females of other species sometimes have small ones. Antlers (q.v.) are outgrowths of bone, which are covered with a thin, highly vascular hairy skin during their growth, but when this is completed the blood-supply is cut off, and the skin, or 'velvet,' as it is called, dries up and is peeled off, leaving the bone bare. Antlers are renewed annually, the fully formed pair becoming detached from the 'pedicels' on which they were developed, and a new pair arising at the same place. Antlers are usually shed soon after the close of the breeding season. An antler may be straight and unbranched, but usually there are branches, called *tines* or *snags*. The number of these increases with age, so that the most handsomely developed antlers are found only on fully matured males. The antler and its branches are generally more or less cylindrical or terete, but in some cases they are very much expanded and flattened, and the antler is then called 'palmated.'

Deer are animals of very graceful form, combining compactness and strength with slenderness of limb and fleetness. They have for many centuries been renowned as objects of the chase, and the flesh of many species is highly esteemed for food, under the name 'venison.' The best-known species, which may serve as an example of the group, is the European red deer (*Cervus elaphus*), the adult male of which is the 'stag,' and the female is the 'hind.' The former is sometimes nearly seven feet long and over four feet in height, but the hind is much smaller. The body is covered by a double coat of fine wool and longer, coarse hairs, the latter longest on throat and chest. The wool is brownish-gray, and as it is longest and most abundant in winter, the summer coat is brighter-colored and smoother. The young are spotted with white. The antlers are at first unbranched and only show the number of tines characteristic of the adult in the fifth year, and it is not until then that the young male is dignified with the name *stag*. An old stag is called a 'hart.' The hinds and young stags are usually found together in large herds, but the older stags occur in smaller groups, while harts are generally found alone. The feeding time is during the evening and at night. The food varies with the season; in winter it is chiefly lichens, moss, bark, and buds, while in summer leaves and herbs form most of the diet. Stags are said to eat only fungi during the breeding season. The red deer occurs in all parts of Europe and in northern and western Asia. It is exterminated as a wild animal in populous districts, but is preserved as an object of the chase, or as a semi-domesticated pet, in all parts of western Europe, though not so common in Great Britain as the fallow deer. It is exceptionally swift of foot and an excellent swimmer, and all of the senses are marvelously acute. The hinds and fawns are gentle and can be tamed as pets, but the stags are untrustworthy and become quite dangerous during the breeding season.

The American deer (*Cariacus* or *Odocoileus Virginianus*) is considerably smaller than the stag, but resembles it in many of its habits. It is found throughout the eastern United States, ranging northward into southern Canada, west to the Missouri, and south to Florida and Texas.

West of the Missouri it is replaced by the very similar white-tailed deer (*Cariacus leucurus*), and south of the United States by the Mexican deer (*Cariacus Mexicanus*). The American deer are very fond of water, especially in the summer, and at that season feed very largely on water-lilies, in seeking which they often go far out into shallow ponds and lakes. They are fine swimmers, and often enter the water during the day to escape from flies and other insects, but they feed chiefly at night. Owing to this habit, a method of hunting known as 'jacking' is often practiced, by means of boats. A brilliant light, known as a 'jack-light,' is placed at the bow, while the hunter is stationed in the shadow behind. The boat is then pushed quietly through the lily-pads until a deer is heard or seen; attracted by the bright light, the animal turns full toward it, and the hunter, seeing the reflection of the light in the deer's eyes, can make his aim sure. Under similar circumstances George Shiras, 3d, of Pittsburg, Pa., has secured a series of fine photographs of deer beside lakes in northern Wisconsin, by using a flash-light apparatus, operated by a trigger and instantaneous plates. In color the American deer as somewhat variable, there being a marked seasonal change, as well as much individual and geographical diversity. In summer the upper parts are more or less chestnut red, which becomes more cinnamon-color along the sides; the under parts are white. In winter the upper parts become more gray, so that there is a general slaty-blue cast, and the deer is then said to be 'in the blue.' Deer no longer occur commonly south of Vermont, New York, and Michigan, except in some of the less-settled portions of the Southern States. Protective legislation has led to a marked increase in the number of deer in Vermont and some other States, but excessive hunting during the open season is reducing the numbers elsewhere.

Besides the North American deer above mentioned, the Western mule-deer (*Cariacus macrotis*) demands a word, on account of its remarkable ears. These are eight inches long and well covered with hair.

Classification. The classification of deer is now based largely upon the structure of the feet and the antlers. There are two main groups of deer, the *Plesiometacarpalia* and the *Telemetacarpalia*. The former are all Old World deer, except the wapiti (q.v.), and have the proximal portions of the lateral metacarpals present, and the vomer never divides the posterior osseous nares into two distinct passages. This group comprises the genera Cervulus, the muntjacs (q.v.); Elaphodus, with a single small Chinese species, and Cervus. This last genus includes many species, and is subdivided, chiefly according to the form of the antlers, into seven groups, as follows: (1) Rusine, in which the antlers have no tine (known as the *bez*) just above the lowest or brow tine, the beam is upright and simply forked at the tip, the brow tine rises close to the base, and the angle formed with the beam is acute; (2) Rucervine, beam somewhat flattened, and bifurcates into two branches, which again divide, and the brow tine is given off at an obtuse angle and curves upward; (3) Elaphurine, beam straight, erect, with a long, straight back tine; (4) Axine, antlers rusine, but body of adult marked with rows of white spots; (5) Pseudaxine, similar to axine, but the antlers have a forked beam, of which the posterior tine is the smaller; (6) Elaphine, a bez tine is present and the rounded beam splits up into a number of small tines often arranged in a cup-like manner; (7) Damine, the antlers are palmated near the tip. See Antler, where illustrations of various forms are given.

Of these seven groups, the Elaphine is the most important, including the red deer and wapiti, but the well-known sambur (*Cervus Aristotelis*) of India is rusine, the swamp deer (*Cervus Duvaucelli*) of the same country is rucervine, the axis is axine, the Japanese deer (*Cervus sika*) is pseudaxine, while the fallow deer (*Cervus dama*) is damine.

The Telemetacarpalia include all the American deer except the wapiti, and several Old World species also. The distal extremities of the lateral metacarpals are present and the vomer usually divides the posterior nares into two distinct orifices. The genus Rangifer contains the reindeer and caribou; Alces, the elk, or moose; and Capreolus includes the roe-deer of Europe and Asia. The Chinese water-deer is a remarkable little species without antlers, and is the sole representative of the genus Hydropotes. The genus Cariacus includes, besides the three species already mentioned, a number of others found in the western United States, and in Central and South America. They may be grouped in four sections known as the Cariacine, Blastocerine, Furciferine, and Coassine. The North American deer all belong in the first section, while the last one includes the small South American deer known as brockets. The genus Pudua includes only a single diminutive species, the pudu, which is less than eighteen inches high, and lives in the Andes of Chile.

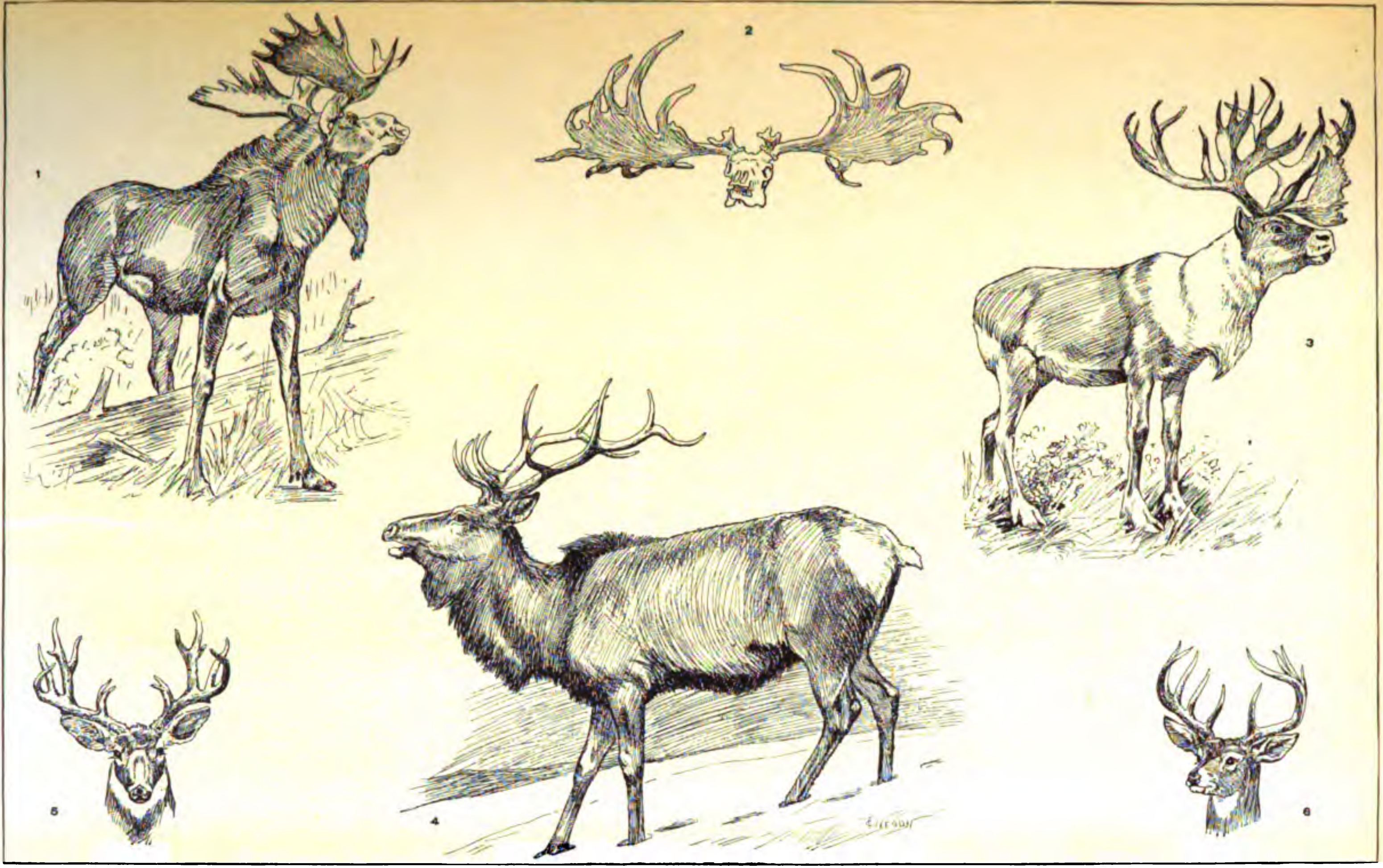
Fossil Deer. The earliest fossil remains of deer are found in the Middle Miocene strata, where the group is represented by several species of Palæmertyx, at least one of which had antlers. Remains of other genera occur in the Pliocene and Pleistocene. Cervus proper appears in the Pliocene. The notable giant deer, or 'Irish elk' (*Cervus giganteus*), possessed enormous palmated antlers, 11 feet from tip to tip. It represents a distinct section of the genus, called megacerotine. The remains are found in Pleistocene deposits over a large part of Europe, but are especially common in the peat-bogs of Ireland, where they were first discovered. See Elk.

Consult: Hamilton-Smith, (editor of) *Griffith's Animal Kingdom* (London, 1827); Caton, *Antelope and Deer of America* (New York, 1877); Lydekker, *Deer of All Lands* (London, 1898), colored quarto plates, with descriptions of all species; Roosevelt (and others), *The Deer Family* (New York, 1902); Scrope, *Days of Deer Stalking* [red deer] *in the Scottish Highlands* (London, Hamilton's ed., 1883); Saint John, *Sportsman and Naturalist in Sutherlandshire* (London, 1891); Jeffries, *Red Deer* (London, 2d ed., 1892); *Deer Stalking* ["Fur and Feather Series"] (London, 1896).

See Elk; Moose; Musk-Deer; Reindeer; Sika; and other names of deer; also Plates of Deer of North America; and of Fallow Deer, Musk, etc. (with article Deer-Stalking).

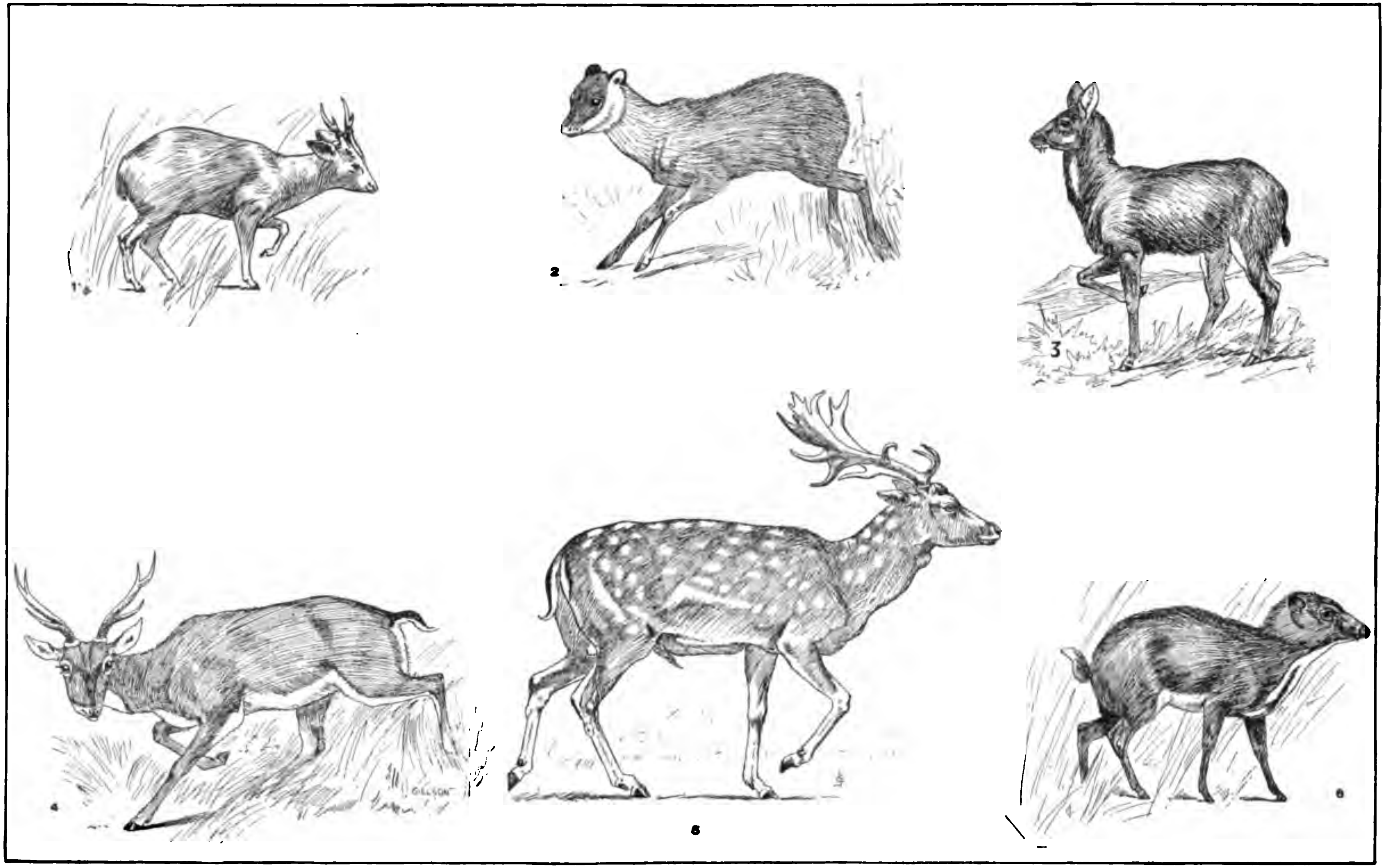
DEER, or DEIR, Old. A picturesque village and parish in the northeast of Aberdeenshire, Scotland, in the district of Buchan (Map: Scotland, F 2). It is chiefly known in connection

DEER OF NORTH AMERICA



1. MOOSE OR EUROPEAN ELK.
2. ELK-LIKE ANTLERS OF EXTINCT IRISH DEER.
3. WOODLAND CARIBOU OR AMERICAN REINDEER.
4. WAPITI; the "elk" of the Western United States.
5. MULE DEER OR BLACKTAIL.
6. EASTERN, VIRGINIAN, OR WHITE-TAILED DEER.

FALLOW DEER, MUSK, ETC.



1. INDIAN MUNTJAC (Cervulus muntjac).
2. CHILEAN PUDU DEER (Pudua humilis).
3. MUSK (Moschus moschiferus).
4. PAMPAS DEER (Cervus campestris).
5. FALLOW DEER (Cervus dama).
6. MALAYAN CHEVROTAIN (Tragulus Javanicus).

with the *Book of Deir,* which came from its Cistercian monastery, founded about the year 1219 by William Cumyn, Earl of Buchan, on the site of a church established by Saint Columba and his disciple, Saint Drostan, about the year 580. The remains of the monastery are unimportant. In 1715 MSS. which had belonged to the monks of Deir found their way to the university library at Cambridge, but the value of the *Book of Deir* was not discovered before 1860. It contains a copy of the Gospels (in the Latin version of Saint Jerome) and of the Apostles' Creed, in the handwriting of the ninth century, with a portion of a Missa de Infirmis, or 'Communion of the Sick' (containing an illuminated Celtic or Gaelic rubric), in a later hand. On the blank leaves at the beginning, in the handwriting of the early part of the twelfth century, are notes or memorials, in the Celtic or Gaelic language, recording immunities and endowments bestowed upon the church of Deir. These notes or memorials are of great philological interest, as the only known examples of the Celtic speech of Scotland in the twelfth century. Consult Stuart (ed.), *The Book of Deir* (Spalding Club, 1869).

DEERFIELD. A town including four villages, in Franklin County, Mass., on the Connecticut River, and on the Boston and Maine, and the New York, New Haven and Hartford railroads (Map: Massachusetts, B 2). It has agricultural interests and manufactures of pocketbooks. The town contains a public library, Dickinson High School, and Deerfield Academy. Government is administered by annual town meetings. Population, 1900, 1969; 1905, 2112. A part of the town was annexed to Greenfield in 1890.

Deerfield was founded in 1671, and incorporated in 1673. Near by, on September 19, 1675, the Indians caught Captain Lothrop and 84 men in an ambuscade. The latter being reinforced, the Indians were driven off, but the colonists had suffered a loss of 63 killed and 7 wounded. On February 29, 1704, the French and Indians surprised the place, killing 49 and capturing 100 of the inhabitants, while all the buildings were destroyed except the church and one dwelling-house. The captives were taken to Canada, a number being murdered on the way. The survivors were liberated in 1706. Consult: Sheldon, *A History of Deerfield, Mass.* (Deerfield, 1895-96); and Powell, *Historic Towns of New England* (New York, 1898).

DEERFIELD RIVER. A river rising in Windham County, southern Vermont. It flows south into Massachusetts, where it bends to the southeast and empties into the Connecticut River near Deerfield. It is about 60 miles long in a general direction, and drains an area of 650 square miles. The stream has a fall of 1028 feet from Readsboro, Vt., and furnishes extensive water-power there and at Hoosac Tunnel and Shelburne Falls. Its valley is famed for its beauty.

DEER-FLY. A gad-fly which attacks deer; especially, in North America, the small green or yellow tabanids of the genus Chrysops.

DEERHOUND. See GREYHOUND.

DEER-MOUSE. Any of several wild mice, which resemble a deer in colors and movement. The name is most properly applied in North America to the jumping mouse (*Zapus Hudsonius*), but is also given to the white-footed mouse (*Peromyscus leucopus*). See MOUSE and Plate of MICE AND JERBOAS.

DEERSLAYER, THE. One of Cooper's *Leatherstocking Tales,* the first of the series written, but published last (1841). The title is the sobriquet of the leading character, Natty Bumppo.

DEER-STALKING. To stalk or steal up to game under cover is an attractive sport, with many variations of method in different countries, and even different parts of the same country; seeing that the deer ranges in North America alone, from the arctic circle of northern Canada to the bayous of the Mexican Gulf. The term 'stalking' is derived from the Scottish Highland method of hunting the deer in the so-called Scottish forests, which are not forests at all, but bare hill-tops and rugged glens, upon many of which even a rabbit would find it hard to live, much less a deer. Large tracts of land in Scotland, barren and otherwise useless, are left to the deer, with profit to the owners, who let the ranges for sporting purposes. The deer are located by a careful reconnaissance of the district, in which operation woodcraft and hunting skill are the prime essentials. For instance, their probable location will depend upon the weather; on fine, warm days the big stags will be on the highest hills, and on wet or stormy days they are usually on the lower land. In the morning they will be feeding and moving, and by midday will be lying down. When a suitable stag has been located, the difficulty will be to get within shooting distance without his seeing, hearing, or smelling the hunter; consequently the direction of the wind is the first consideration. There is practically no chance of success unless the hunter stalks 'up wind,' or across the wind in a position to insure that scent of him will not alarm the deer. Then again, the deer may be feeding, in which case they will move up wind at a fairly good rate, and the hunter has to calculate where his path and theirs will cross, by the time he can secretly approach them. These points determined, he takes a well-screened path, and cautiously approaches the point he has settled on from which to get a shot. In the last stretch of this, he may have to crawl up-hill flat on his stomach, pull himself along on his elbows, or he may have to creep down-hill, feet foremost, for deer seldom look up-hill when feeding. When the deer is again sighted, the problem is to guess his distance, concerning which a very successful authority has laid down the following rules: "Up to 80 yards, the deer's eye is to be seen distinctly, at 100 yards the shape of the eye is no longer discernible, but only the dark line is visible. Up to 150 yards the ears are plainly to be seen, but at 200 yards they are well-nigh invisible." Practice alone will tell the hunter how far to 'hold' in front of a walking, running, or galloping deer; but the following instructions are safe: At a walking deer aim straight at the heart; at a slowly trotting one, at the front of the shoulder; when on a quick trot, just see daylight in front of him; and for a galloping one, give two or three feet grace. The red deer of Scotland vary in weight from 200 to 400 pounds.

In America the method of stalking varies with the kind of deer and the locality. The method of following the Canadian caribou and Maine deer through thick forests and deep snow of necessity varies from those adapted to the black-tail of California and the deer of Louisiana. In the extreme northern forests it is not possible to place or locate the deer with a field-glass; their track must be found, and in the snow it is the more easily detected. The hunter, clad in loose woolens from head to foot, threads among the beech and birch, and balsam and hemlock, until he comes across the sign. This he interprets from experience, for nothing else will teach him. In what direction and at what pace was the deer going? Was it a single stag? How long since had it passed? These and many other questions must be settled before he begins his quest on his snow-shoes; and even then he will have need of all his wits, for the deer is keenly alert to the slightest indication of danger. To baffle the hunter, he will double back on his track and jump sideways, apparently disappearing into the earth. He will rout up another deer and use him as a catspaw, or, better still, mix with a number of others until all individuality is apparently lost; or he will follow the slot of another deer, or take to the water, or make for a swamp of shell ice and crackling cedar-brush. In the forest-covered hills of northern California, a guide takes a pair of dogs (shepherd dogs, for preference) into the woods, who hunt until they jump a deer. The hunters dismount and spread out, each taking a position known to the others—the dogs drive the deer out of the brush, and that hunter who is most favorably situated gets the shot.

In Louisiana the deer are hunted by a pack of hounds, some dozen or so of the large black-and-tan Louisiana deerhounds, with long, drooping ears, low, pendent dewlaps, deep chests, and straight tails. They are taken to the scene of the hunt in a wagon. The huntsman finds the track in the soft soil on the edge of the live-oak wood; the dogs are put on the trail and disappear within its gloomy, moss-hung recesses. The gunners form a skirmish line across from marsh to marsh, and, as the deer is chased within range, he is shot and given the *coup de grâce*, or the dogs will eventually pull him down and kill him. In other parts of the South the deer is 'fire-hunted,' or 'shined,' in which undertaking the hunters go through the woods at night bearing a blazing light in front; presently its glare strikes the eyes of a deer, which, fascinated by it, stands and stares curiously for some time, during which interval the hunters cautiously approach and shoot it. In the Eastern States hunting with jack lights is prohibited, and hunting with hounds is not permitted. Even the ownership of a dog for hunting deer is forbidden. When they are "still-hunted," the hunter sets out alone without dog or guide, picking out the track, reading all its lessons, and following it through all its sinuosities, until success rewards him. 'Still-hunting' is nearer to the Scottish stalking than any other form used in America. In the Caucasian Mountains of Russia the deer are 'called,' i. e. the call of the female is imitated by the hunter, and the deer, attracted by it, or the challenge of defiance of one stag to another, brings them to a place where the hunter has an opportunity to shoot them. In the province of Bombay a very simple practice is followed by the natives: Deer are located and watched until they have eaten their fill, and lie down to chew the cud. As soon as they are completely settled, the native will very gently break a stick, making just enough noise to rouse the deer and unsettle them, so that they get up and move off. As soon as they lie down once more he makes a like noise, and the deer rise again. He continues this, increasing his disturbance, until the food in the deers' stomachs, not being properly digested, begins to trouble them, and they become so swollen and uncomfortable that they cannot run, when the hunter shows himself and shoots them. Consult: Van Dyke, *The Red Deer* (New York, 1896); Macrae, *Handbook of Deer-stalking* (Edinburgh, 1880); Van Dyke, *The Still-Hunter* (New York, 1882); Scrope, *Days of Deer Stalking* (London, 1838); Grimble, *Deer-Forests of Scotland* (1896); id., *Highland Sport* (London, 1896).

DEER-STEALING. In English law, the statutory offense of hunting, killing, or carrying off any deer in any forest, chase, or park, whether private and inclosed or public and uninclosed. By the common law, deer at large are *feræ naturæ* (wild animals), but the penchant of the Norman kings and their immediate followers for the hunting of deer caused that animal to be invested with a peculiar sacredness, and led at a very early period to the enactment of stringent forest and game laws for their protection. The matter is now regulated by a series of game laws, beginning with 16 George III., c. 30. See FOREST; GAME LAWS; POACHING.

DE FACTO (Lat.). A legal phrase, signifying actual, based on fact; as distinguished from *de jure*, which means based on law. It is commonly employed of the occupancy of public office or the exercise of political or other authority without legal warrant or by one whose legal title thereto is defective. Under a government of law, a merely *de facto* authority may always be impeached, the proper legal remedy in England and in the United States being by the common-law writ of *quo warranto*, issued by a court of competent jurisdiction, to bring the offender into court and inquire 'by what warrant' he has presumed to exercise the office or authority in question.

Used in this general sense, as opposed to a *de jure*, or lawful, authority, the exercise of *de facto* authority is always a usurpation, and it maintains this character so long as it continues, or until it is legalized by proper legislative or other authority. Any public office, administrative, legislative, or judicial, may be usurped and its powers exercised by *de facto* authority; but the phrase has no application to the case of an excessive or other illegal exercise of power by a duly constituted authority, which does not amount to an assumption of any other office than that which it possesses. Nor does mere usurpation of an office without the actual exercise of its functions constitute the usurper an officer *de facto*. The authority claimed must be effective and actually exercised in order to give it the *de facto* character.

It is in this general sense of a power actually exercised, but without legal authority, that the term *de facto* is employed in international and constitutional law. It is thus applied to a revolutionary government, as the Continental Congress—whose acts gained legal sanction through the success of the Colonies and the recognition of their independence by Great Britain—

or the President and Congress of the Confederate States—whose *de facto* exercise of authority gained for them a certain measure of international recognition, but remained to the end, in point of law, an illegal usurpation. Acts performed by such an authority are wholly void and may be impeached in any proceeding, direct or collateral.

In administrative law, however, the term *de facto* is commonly used in a narrower sense, to describe the exercise of illegal authority, but with apparent right and under color of legal authority. The acts of an officer thus acting have a certain validity, so far as the interests of the public and of third persons are concerned, and cannot be questioned in any collateral proceeding. But they may be directly impeached—as by a refusal to recognize the *de facto* authority, or by instituting proceedings to test the usurper's title to the office exercised by him, or, at the common law, by a civil suit for the wrongful intrusion into office or for the profits thereof taken by the usurping official. But the mere possession of an office is *prima facie* evidence of a valid title thereto, and *de facto* authority is presumed to be *de jure* also, until the contrary is made to appear in an appropriate proceeding instituted for that purpose. See ADMINISTRATIVE LAW; OFFICE; also the authorities there referred to.

DEFAMATION (Lat. *diffamare*, from *dis*-, priv. + *fama*, report). The infringement of the right of reputation; specifically, the publishing of any matter concerning an individual which is untrue in fact, and which has a tendency to impair his public reputation. The right of every man to the good name which he has earned by a long course of good conduct is recognized by every developed system of law. It is regarded as a species of property, a valuable asset, of which no one can deprive him with impunity. Its violation is a legal wrong, or tort, and it may, under some circumstances, be a public wrong or crime.

As reputation is the estimation in which a man is held by the community in which he lives, the gist of the injury lies in the publication of the imputation upon his character. If communicated to him privately or written out for the purpose of publication, but not actually communicated to a third party, it is no violation of the right of reputation, no matter how unjust it may be. Furthermore, the law will protect reputation only in so far as it is fairly earned. A truthful imputation upon character is no violation of the right. But even the publication of derogatory matter which is in fact untrue may not amount to defamation in the legal sense. The imputation may be too vague and general, or too trivial to be regarded, or, although definite and harmful, it may be uttered under such circumstances of privilege as to justify and excuse it.

In general it may be said that an action will lie for defamation in those cases, and in those cases only: (1) In which the charge or accusation is shown to have caused special pecuniary damage to the plaintiff; (2) in which the plaintiff is charged with the commission of a crime; (3) in which the present existence of an offensive contagious disease is imputed to him; (4) in which the conduct of his profession or trade, or of an office of public trust held by him, or his fitness therefor, is impugned; (5) in which unchastity is imputed to a woman. In all these cases but the first, the words or acts charged are defamatory *per se*, and are actionable without proof of special damage resulting therefrom, and in all of them the action will lie whether the derogatory words were spoken or written. In the case of a written imputation, however, which is technically called a libel, special damage need never be shown, but it is enough to satisfy the jury that the words complained of were such as to bring the plaintiff into ridicule, odium, or contempt.

The most important and comprehensive ground of justification for imputations upon character is the privilege of fair criticism and comment on public men and affairs. This exists only in communities, like England and the United States, in which the government is of a free and popular character, and the liberty of the press and of public discussion has reached a high point. This privilege does not cover mere abuse, nor the malicious imputation of dishonesty and incapacity, nor the invasion of the private and domestic life of the person accused, unless this has some bearing on public affairs. But every citizen is protected in the honest expression of opinion, however severe and unjust it may be, concerning matters of public interest and general concern, whether political or not, so long as the limits of fair criticism are not exceeded. Privilege may also exist in matters of private concern, under special circumstances, as in comments on character made by a judge, advocate, or witness in the course of a judicial proceeding, such statements being privileged unless made maliciously or recklessly.

Reference has been made to the fact that the publication of defamatory matter may, under some circumstances, be a violation of the criminal law. This is never true of mere slander, or spoken defamation, but only of libel; and it is theoretically justified on the ground that written or printed attacks on character are likely to lead to breaches of the peace or to prove subversive of the good order and morals of the community. It seems more probable, however, that the criminal proceedings in libel cases are a survival of the primitive right of private vengeance for injuries of this character, which has, in process of time, been taken over by the State. See TORT; LIBEL; SLANDER; PRIVILEGED COMMUNICATION; and consult the authorities there referred to.

DEFARGE, de-färzh′, THÉRÈSE. The wife of the keeper of the wine-shop in Dickens's *Tale of Two Cities;* a type of the remorseless virago of the French Revolution. She is constantly knitting. She and her husband are the faithful guardians of Dr. Manette during the madness that succeeds his release from the Bastille; but they afterwards seek the life of his daughter's lover, who is connected with a certain noble family which has incurred their deadly hate.

DEFAULT (OF. *defaulte*, It. *diffalta*, from Lat. *de*, away + *fallere*, to fail). In law, the failure of a party to a suit to take the next step in the process of litigation incumbent upon him, within the time limited by the practice of the court. Originally, the term was limited to the non-appearance of a party in court on the day assigned in the writ or summons, but it is now employed of a similar failure at any stage of the cause. In general, the effect of a default on the part of the plaintiff is to entitle the opposing party to a non-suit, and the default of the defendant renders him liable to a judgment in accordance with the demand of the declaration or complaint. Formerly, in suits at law, these results were final, but the procedure of the equity tribunals permitted the opening of defaults for cause shown, and this is now the general practice, at law as well as in equity, in the courts of England and the United States. Usually, however, the default can be reopened and the cause reinstated on the calendar of the court only on the payment of moderate costs by the party in default. See PROCEDURE.

DE FAUX, de fō′, ALEXANDRE (1826—). A French landscape painter, born at Bercy. He was a pupil of Corot, and painted in the manner of that artist, but was in no sense a copyist. His best pictures are "Spring in the Woods" (1875, second-class medal), a fine study of trees in bloom; "From Honfleur to Pennedepic" (1878); "The Banks of the Loing" (1890); and "The Port of Pont-Aven" (1880), and "Morning at Château Loudon," both in the Luxembourg. He received the medal of the Legion of Honor in 1881.

DEFEASANCE (OF. *defeisance*, from *defaire*, Fr. *défaire*, to make void). A proviso annexed to a conveyance of land or goods, whereby the latter shall become void in some specified event. At common law, the term was confined to such a proviso contained in a separate instrument from the act or deed of conveyance, the term *condition* being proper to describe a similar term or provision contained in or forming a part of the conveyance itself. At the present time, however, the latter is often referred to as a clause of defeasance. It is commonly employed to effect a mortgage, which is, properly speaking, a conveyance of property with a defeasance reinstating the title of the mortgagor upon the payment of the mortgage debt. In the United States the defeasance is usually incorporated in the mortgage deed, but in England a mortgage often takes on the form of an absolute deed with a separate deed of defeasance, made by the mortgagee to the mortgagor, specifying the condition on which the conveyance of the property is to become void. Ordinarily, a separate instrument of defeasance must be delivered at the same time as the deed of conveyance which it is intended to affect, so as to form part of the same transaction. If given subsequently, it may have the effect of a covenant, enforceable in a separate action by the grantor of the property, but it will not, in that event, convert the grant into a mortgage.

At common law it is also necessary that a separate defeasance, in order to have the intended operation, should be 'of as high a nature' as the conveyance itself, that is, should also be in the form of a deed. But the courts of equity have always admitted parol evidence of the agreement, understanding, and purpose with which a conveyance was made, and have given effect to such a proviso, even though it was not embodied in a deed or other written form. Accordingly, an absolute deed conveying a parcel of land for the real purpose of securing the payment of a debt is, in practical effect, a mortgage, and may be redeemed as such. In New York and a few other States a parol defeasance may also be proven in the courts of common law, though this has not become the practice generally in the United States or in England. See CONDITION; MORTGAGE; and the authorities there referred to.

DEFENDANT. The person who is sued in action at law or in equity. Blackstone says, "In every court there must be at least three constituent parts—the *actor*, or plaintiff, who complains of an injury done; the *reus*, or defendant, who is called upon to make satisfaction for it; and the *judex*, or judicial power, which is to examine the truth of the fact, to determine the law arising upon that fact, and, if any injury appears to have been done, to ascertain, and, by its officer, to apply the remedy" (3 Bl. Com. 25).

The term was originally limited to the person sued in a *personal* action at common law, the one against whom a *real* action was brought being described as 'the tenant,' the complaining party in that case being known as 'the demandant,' and these expressions are still employed to distinguish the contending claimants to real property in several of the United States. But in most States, as well as in England, the term defendant has come to designate the party used in any form of action and in any court. See PARTIES.

DEFENDER OF THE FAITH (Trans. of the Latin, *Fidei Defensor*). A title conferred on Henry VIII. by Pope Leo X. in recognition of his treatise, *Assertio Septem Sacramentorum*, directed against Martin Luther, in 1521. When Henry suppressed the religious houses at the Reformation, Pope Clement VII. recalled the title and deposed him. In 1544 Parliament confirmed the title, which has ever since been used by the sovereigns of Great Britain. The corresponding title in Spain is *Catholicus* (Most Catholic), and in France was *Christianissimus* (Most Christian King).

DEFENDER OF THE MARRIAGE TIE (*Defensor Matrimonii*). An office created by Pope Benedict XIV. in the year 1741. Its object is, in all cases of actions for divorce, or any attempt to annul the marriage tie, to defend the marriage bond in its integrity. Marriage, being a sacrament in the Catholic Church, is, like the other sacraments, most jealously guarded. The 'defender' is clothed by ecclesiastical authority with the same or similar powers that the prosecuting attorney in civil law, in criminal procedure, is endowed with. He usually acts as a referee in civil-court proceedings. The office was instituted in America by the Third Plenary Council of Baltimore in 1884, and is now extended until each Catholic diocese has its 'defender' ecclesiastically appointed, ready to defend the integrity of the marriage agreement before any court of proper jurisdiction.

DEFENSE (Lat. *defendere*, to ward off). In criminal law, the right of forcible resistance to an attack by force on person or property. The exercise of this right may be a justification of the charge of assault or homicide. It is restricted to the employment of so much force as is reasonably necessary for the protection of one's self, his wife, children, and other members of his household, his personal property, and, where a felony is threatened, as burglary or arson, his real property. He may also resist by force a violent attempt to commit a trespass, even without felonious intent, upon the premises constituting his dwelling. For the limitations upon the exercise of the right of defense, see Assault; Homicide.

In the law of civil and criminal procedure, the answer of the defendant in a suit to the cause of action set up by the plaintiff. As commonly employed under the reformed procedure in England and many of the United States, the defense includes the *demurrer*, in which the facts alleged by the plaintiff are admitted, but their legal effect is denied, and the justification by the defendant of the acts of which the plaintiff complains, as well as the bare denial of the allegations of the complaint or statement of claim. It does not, however, cover a counterclaim (q.v.), or separate cause of action, set up by the defendant.

Under the highly technical procedure of the common law, defense (from French *defender*, to deny) was only the first step in the defendant's answer to the plaintiff's cause of action, and was limited to a denial of the truth or validity of the complaint. This was followed by the *plea*, under which the jurisdiction of the court and the legal validity of the facts alleged in the complaint might be questioned, and the justification of the defendant set forth. This system of pleading still obtains in several of the American States, but the term defense has generally come to have the wider meaning assigned to it above, which includes the plea and demurrer of the defendant, as well as his technical defense. Formerly, also, the term had no reference to the answer interposed by a defendant to the charges contained in a bill or information filed in an equity proceeding, being restricted to actions at law. Under the reformed procedure, however, this distinction no longer obtains, and the term defense may be employed in either forum.

In general, it may be said that the defense must contain a specific denial or justification of each and every allegation of the complaint, together with a statement of any facts relied upon by the defendant to relieve him from the plaintiff's claim of liability. It must usually be verified by the defendant or his solicitor or attorney and served upon the defendant or his legal representative within a limited time—usually twenty days—after the service of the complaint. The defense once made, the cause is at issue, and may usually proceed to trial without further pleading. See Answer; also Demurrer; Plea; Pleading, and the authorities there referred to.

DEFENSE OF POESIE, The. The name under which Sir Philip Sidney's *Apologie for Poesie* was reprinted in 1598, with the third edition of the *Arcadia*.

DEFENSE OF POETRY. A poetical work; the first production of Isaac D'Israeli (1790).

DEF'ERENT (Lat. part, *deferens*, bearing away). An old term in astronomy, signifying a circle on which the centre of another circle moves, while a body is supposed to be moving on the latter itself. If we suppose the sun to be moving round a centre in space, while the earth moves, say, in a circle round the sun, then the sun is moving in the deferent. The term originated in the Ptolemaic system (q.v.).

DEFFAND, dȧ'fäN', Marie Anne de Vichy-Chamrond, Marquise du (1697-1780). A French woman of noble birth, celebrated for her wit. She was born at Chamrond, and represents an interesting intellectual type and literary influence during the period of thought-crystallization that preceded the French Revolution. She was a precocious girl, of independent mind, and in early life a fascinating society woman, not without reproach. In 1753 she became blind; but in her dwelling in the Convent of Saint Joseph, whither she retired, she established a literary salon of great distinction. Mademoiselle de l'Espinasse was for ten wretched years her companion; D'Alembert was also during that time her intimate, as were Voltaire and Montesquieu. With Horace Walpole she corresponded regularly and familiarly. Her influence may be noted in the writings of Madame de Staël, Madame de Choiseul, Madame de Genlis, and many others. She was of caustic wit and epigram, skeptical in spite of herself, but frankly bold, scorning pretense and self-deception. She died in Paris, September 24, 1780. She left *Letters*, and pen-portraits, of which a collection appeared in 1809, supplemented by the *Letters to Horace Walpole*, with a *Life* by Miss Berry (London, 1810). Consult: Perey, *Le président Hénault et Mdme. du Deffand* (Paris, 1893); Asse, *Mlle. de l'Espinasse et la marquise du Deffand* (Paris, 1877); Tallentyre, *Women of the French Salons* (New York, 1901); Ségur, *Julie de Lespinasse* (Paris, 1906).

DEFIANCE. A city and county-seat of Defiance County, Ohio, 51 miles west by south of Toledo, on the Maumee River, at the junction of the Auglaize; on the Miami and Erie Canal, and on the Wabash and the Baltimore and Ohio railroads (Map: Ohio, B 3). It is the seat of Defiance College, opened in 1885, and contains a public library. There are several flour-mills, extensive machine-shops, wagon-works, and other manufacturing establishments, and the city has a large trade in agricultural products, live stock, etc. Pop., 1900, 7579; 1906 (local est.), 9000.

DEFICIENT NUMBER. An integer whose divisors added together make a sum less than the number itself—e.g. 16 is a deficient number, since the sum of its divisors, $1 + 2 + 4 + 8 = 15$, is less than 16. See Perfect Number.

DEFILADING. See Fortification.

DEFILE (Fr. *défilé*, pass). Any passage which compels troops to advance in column formation. See Debouching.

DE FIN'IBUS BONO'RUM ET MALO'RUM (Lat., On the limits of good and evil). A philosophical treatise by Cicero, carefully written, discussing the doctrines of the supreme good and evil. It is in five books, and is dedicated to Brutus.

DEFINI'TION (Lat. *definitio*, from *definire*, to bound, from *de* + *finire*, to fix a limit). The act of making clear one's meaning in the use of a term. This may be done by giving a synonym whose meaning is beyond doubt, as is often done in dictionaries. But traditional logic calls for something more explicit than this. It demands that the *definiendum* (i.e. the term to be defined) shall be put alongside of other similar terms, and, secondly, be clearly distinguished from them. The first requirement is met by assigning the *definiendum* to a class constituted by itself and other terms, designating objects generally similar. This class is called the *genus*. The second requirement is met by stating the attribute or combination of attributes which marks off the objects denoted by the *definiendum* from the objects denoted by other terms within the *genus*. These differentiating attributes or combination of attributes are called the specific difference. A logical definition then is the designation of genus and specific difference.

The question has been debated whether definitions should deal with names or things. The simple answer seems to be that it deals with names of things, meaning by things objects of thought, whether existing in the external world or in the realm of imagination, or in any other conceivable sphere. See LOGIC, and consult the authorities referred to there.

DE FLO'RES. A scoundrel in the service of Vermandero, in Middleton's *Changeling*. He loves Beatrice, his master's daughter, and, at her instigation, murders de Pivacquo. When Beatrice refuses to reward him by returning his passion, he murders her and then commits suicide.

DEFOE', DANIEL (c.1661-1731). An English novelist, the author of *Robinson Crusoe*. He was born in London, and was the son of James Foe, a butcher. The family name was changed to Defoe about 1703. Defoe, whose father was a Dissenter, was educated at a Dissenting academy at Newington Green, with a view to the ministry. About 1685 he went into business, but was unsuccessful. The same year he took some part in the Monmouth Rebellion, and in 1688 he joined King William's army. Engaging in foreign trade, he four years later became bankrupt. In 1698 appeared his *Essay on Projects*, which was followed in 1701 with a famous satirical poem, *The True-Born Englishman*, in vindication of King William, 80,000 copies, mostly pirated editions, being sold on the streets. In 1703 a complaint being made in the House of Commons regarding one of his recent publications, called *The Shortest Way with Dissenters* (1702), in which he argued with masterly irony that the Dissenters should be banished and their preachers hanged, he was pilloried and imprisoned in Newgate. While in the pillory he published his spirited *Hymn to the Pillory*. He was released from prison in August, 1704; but before this he had begun *The Review* (February 17, 1704), a periodical which he continued for nine years. It was at first a weekly, then a semi-weekly, and finally a tri-weekly. Its appearance marks an epoch in the history of periodical literature. In 1706 appeared *The Apparition of One Mrs. Veal*, one of Defoe's masterpieces in realistic composition. The same year he was sent by the Ministry on a secret mission to Scotland to promote the Union. A literary outcome of this was his *History of the Union* (1709). Defoe continued to take an active part in political controversies, and was again imprisoned for a short time in 1713. He died in 1731. Whatever may be the literary value of his miscellaneous writings, numbering above two hundred works, his fame rests upon his fictions. *Robinson Crusoe* (1st part, 1719) was the most popular fiction of its time. It was translated into many languages, and still maintains its original interest. It was immediately followed by several other notable adventures, among which are: *Memoirs of a Cavalier* (1720); *Captain Singleton* (1720); *Moll Flanders* (1722); *Journal of the Plague Year* (1722); and *Colonel Jack* (1722). Defoe possessed perhaps the most remarkable narrative talent of all English writers. Fiction he made appear like fact. He was a realist, and employed all the literary devices that give probability to fiction. For fact in itself he did not greatly care, and was rather fond of the literary hoax. His method was the very practical observation of common things about him, but to these unobserved commonplaces his genius communicated breath. While his style is apt to be journalistic, at its best, it is characterized by a nervous energy and a homely simplicity which in his peculiar work leave nothing to be desired. Consult: Aitkin, *The Romances and Narratives of Defoe* (London, 1895); Lee, *Newly Discovered Writings, with Life* (3 vols., London, 1869); Dobson, the reprint of *Robinson Crusoe*, with bibliography (London and New York, 1883); Minto, *Defoe* (London, 1879); Wright, *Life* (ib., 1894); Wherry, *Daniel Defoe* (ib., 1905).

DEFORCEMENT (OF., from *deforcer*, from ML. *difforcaire*, to deprive by force). In English law, an ouster or deprivation of the freehold (q.v.). It is the holding of any lands or tenements to which another person has right. In this sense it includes as well an abatement, intrusion, disseizin, or discontinuance, as any other species of wrong whatsoever, whereby he that has right to the freehold is kept out of possession. But in its strict sense it is only such a detainer of the freehold from him that has the right of property, but never had any possession under that right, as falls within none of those injuries. The party thus wrongfully retaining possession was called the *deforciant*, and was said by Blackstone (2 *Com.* 196) to have an apparent right of possession. There was this difference between a party retaining possession of the freehold by means of deforcement and one who occupied by any of the other modes of ouster, that in the former case the party ousted had no right of entry (q.v.). This, previous to the reign of William IV., was a matter of some importance, inasmuch as the claimant was thereby debarred from recovering possession by means of entry or ejectment, and was driven to the more tedious process of asserting his right by a real action (q.v.). But by 3 and 4 William IV., c. 27, all real actions, except four, having been abolished, this distinction between deforcement and the other means of ouster has ceased to have the same practical importance.

DEFOR'EST, JOHN WILLIAM (1826-1906). An American author and soldier, born at Humphreysville (now Seymour), Conn. He was educated in Europe, and spent some years in the Levant. Before the Civil War he wrote *Oriental Acquaintance* (1856); *European Acquaintance* (1858); and *Seacliff* (1859), a novel. He entered the Civil War as captain of volunteers, and served throughout the contest, especially in the Shenandoah Valley and Louisiana, emerging with the brevet of major. After the war he served under the Freedmen's Bureau for three years, then took up the life of a voluminous writer and frequent traveler. Between 1870 and 1880 he published no fewer than nine novels, among them: *The Wetherell Affair* (1873); *Honest John Vane* (1875); and *Justine's Lovers* (1878). He wrote also *The DeForests of Avesnes, and of New Netherlands* (1900), and *Poems: Medley and Palestrina* (1902).

DEFORMED TRANSFORMED, THE. A drama by Lord Byron (1824), based partly on an old story, *The Three Brothers*, and partly on Goethe's *Faust*.

DEFORMITIES (Lat. *deformitas*, ugliness, deformity, from *de*, away, off + *forma*, form, shape). Varieties of form which mar the external appearance. Deformities may be divided into congenital and acquired, according as they occur before or after birth. The former class were considered by the ancients to carry some important meaning in their mysterious shapes, and to show the anger of the gods; hence, they termed them monsters, from *monstrare*, to show; and even in later times they were popularly believed to be the result of the most hideously unnatural combinations. Modern scientific writers have, however, made them a subject of special study under the name teratology (Gk. τέρας, *teras*, monster, and λόγος, *logos*, science), and their researches have shown that deformities generally depend on some arrest of development of the fetus, or some accidental position it has assumed, or some inflammatory disease which has caused unnatural adhesion of parts. It has been found that in Paris one monster occurs in about 3000 births. Deformities are more common among domestic than wild animals, among mammalia than birds, and are very rare among fishes and the invetebrata.

It is a common belief that the mind of the mother has an influence over the shape of her infant; but although some singular coincidences have occurred, there is no scientific proof that such is really the case. Yet the theory was universally adhered to in the Middle Ages; it was, in fact, often appealed to in the interest of mercy, as a loophole of escape for pregnant women who, by the barbarous ignorance of the time, might be condemned to torture. Even at the present day, no scientific demonstration to the contrary has proved sufficient to undermine the absurd belief. That deformities are in many cases hereditary may be seen in the instances of additional fingers and toes, and of harelips. It seems uncertain whether the male or female parent chiefly influences the occurrence of deformity in the offspring. Cases are reported of a family of three with harelips, whose father alone is similarly deformed; and another family of three, with perfectly formed mouths, whose mother has an uncorrected and extremely unsightly harelip. The chief congenital deformities may be classed under the following heads: (1) *Deformity as regards the number of parts.*—The Sirens, for instance, have apparently but a single inferior extremity, which tapers to a point, and the Cyclopes have but one eye. In some cases the head itself, or some organ, as the brain, may be absent. Such deformities, from a deficiency of part, may also result from amputation of portions of the limbs of the fetus, when still within the uterus, by the pressure of the umbilical cord. Curiously enough, however, it often happens that this intra-uterine amputation of parts leads indirectly to an exactly opposite condition—namely, a multiplication of parts arising from the stumps left by these uterine amputations, the fetus in the early stages of its growth appearing to possess something of the power of reproduction of parts observed in most of the lower orders of animals. The parts most commonly reproduced are fingers and toes, or, most commonly of all, only abortive portions of these, as little projections, from the stump of the limb, with traces of nail, and sometimes a single joint with an imperfect bony development. We see a new growth of little fingers or toes according to the member lost, and this power shows itself sometimes without being preceded by such an injury, in additional fingers, toes, etc. These parts are generally close to the similar natural ones, but not always, as, for instance, an ear in the neck. (2) *Deformity with regard to size.*—This may involve the whole body, as in dwarfs, of whom there have been some remarkable peripatetic specimens: the Corsican fairy was only 2 feet 7½ inches high; Mlle. Crachami, the smallest child that ever lived, died at ten years of age, only 20 inches in height. This kind of deformity is not necessarily hereditary; the father of Borowlaski, who was only 39 inches when thirty years old, had six children alternately short and tall, and dwarf women have brought forth infants as long, when extended, as their mothers. In some cases one limb only is diminutive. Of course, deformities the opposite of these exist, such as giants, or instances of premature or excessive local growth. O'Byrne, the Irish giant, measured 8 feet 4 inches when he died at the age of twenty-two. Such individuals are generally subject to premature decay. (3) *Deformity as regards shape.*—This results generally from retarded growth, the parts of the embryo not consolidating as growth advances, as in harelip, or from irregular muscular contractions as in clubfoot (q.v.); or by two or more parts coalescing, as two fingers; or in cyclopy, when both eyes run into one. (4) *Deformities of color* are frequently coexistent with a tendency to, or the presence of, some disease. There may be a deficiency of coloring matter, as in albinos; or an apparent increase, as in cyanosis (q.v.), or 'blue disease,' arising from the partition between the right and left sides of the heart not being completed; or from pigment abnormally placed in the body, as in the mottled individuals shown in caravans. (5) *Deformities of continuity* occur from the lateral halves of the embryo not completely closing, as seen in clefts of the back, the palate, etc. Acquired deformities will be noticed under their special names.

DEFREGGER, dâ′frĕg-ĕr, FRANZ VON (1835—). A distinguished Austrian genre painter, widely popular through his delineations of Tyrolese every-day life and of many stirring episodes in the history of his native land. He was born at Stronach, Tyrol, April 30, 1835, the son of a peasant, and showed early a talent for drawing and wood-carving, which he practiced untutored while tending his father's cattle. His career began late, for he lacked instruction till, in 1860, he went to Innsbruck to study sculpture under Michael Stolz, who, discovering his greater talent for painting, sent him to Munich, where he studied at the academy under Anschütz. After eighteen months spent in Paris (1863-65) and a sojourn at home, he returned to Munich in 1866, and in the spring following became the pupil of Piloty, to whose influence he is indebted for his brilliant technique. He now also found the sphere in which he was soon to score success after success, such subjects as "Joseph Speckbacher and his Son" (1863; Ferdinandeum, Innsbruck), a patriotic scene of soulful conception, and "Wrestling Match in Tyrol" (1869), a spirited representation of this popular sport of his countrymen, being received with great favor, and most of his subsequent efforts finding their way into the principal galleries of Germany. The most noteworthy among these are: "The Last Summons" (1874, Vienna Museum), a stirring episode from the rising of the Tyrolese in 1809; "Return of the Tyrolese Riflemen in 1809" (1876, National Gallery, Berlin); "Andreas Hofer on his Way to Execution" (1878, Königsberg Museum); "Storming the Red Tower at Munich in 1705" (1881, Pinakothek, Munich). But he appears to even greater advantage in his village genre scenes, such as "The Prize-Horse" (1872); "The Zither-Player" (1876, Vienna Museum); the cleverly ironical "Fashionable Tyrolese" (1882, National Gallery, Berlin); "The Fortune-Teller" (1891); "Before the Dance" (1892), and many others that have become widely known through reproductions. Truth to nature, keen insight into character, exquisite coloring, and quaint humor are the main features of his compositions, not the least of whose attractions is the uncommon variety of phases of human nature represented. He was appointed professor at the Munich Academy in 1878 and was ennobled in 1883. A "Defregger Album," with text by Rosegger, was published in Vienna, 2d ed. in 1889-92, and "Vom Land Tyrol," a collection of pictures with text by Haushofer, in Munich, 1895. Consult: Rosenberg, "Defregger," in Knackfuss, *Künstler Monographien* (Bielefeld, 1896), and Meissner, *Franz von Defregger* (Berlin, 1901).

DEFTERDAR, dĕf′tẽr-där′ (Turk. *defterdār*, from Pers. *daftar*, book + *dār*, keeping, holding). A title of the chief treasurer of a Turkish province, as formerly of the Turkish Minister of Finance, who has a seat in the divan and disburses the public money.

DE FU′NIAK SPRINGS. The county-seat of Walton County, Fla., 79 miles east by north of Pensacola, on the Louisville and Nashville Railroad (Map: Florida, B 1). It is in an agricultural and fruit-growing region which produces cotton, rice, sugar-cane, grapes, and peaches; and has also important poultry and stock-raising interests. It is the seat of a Presbyterian College and of the Florida Chautauqua Assembly. Population, 1900, 1661; 1905, 1230.

DE GAR′MO, Charles (1849—). An American educator, born in Wisconsin and educated at the State Normal University, Normal, Ill., and at Halle, Germany. He was professor of psychology at the University of Illinois from 1886 to 1891, president of Swarthmore College from 1891 to 1898, and became professor of science and the art of education at Cornell University in 1898. He was elected president of the National Herbart Society in 1892, and is considered the leader of the Herbartian School in the United States. Among his published works are: *Herbart and the Herbartians* (1896); *Language Lessons* (1897); and a translation of Lindner's *Manual of Empirical Psychology as an Inductive Science* (1889); *Interest and Education* (1902).

DEGAS, de-gäs′, Hilaire Germain (1834—). A French painter, born in Paris, July 19, 1834. He was a pupil of Lamothe and of the Ecole des Beaux-Arts. Though usually classed as an impressionist, he is in reality an independent, his art having been subjected to several different influences, and being, above all else, personal. He at first painted in the manner of Ingres, whom he deemed the greatest of painters, and was also a great admirer of Delacroix, less for that artist's coloring than for the noble action in his pictures. His softness and fluency of modeling resembled the modeling of Manet, and from the Japanese he learned his absolute freedom of composition, fantastic decoration, and peculiar emphasis. His first pictures were historical subjects, but he soon turned to genre pictures of modern life. Among the large variety of subjects which he treated, the best-known are his "Race-horses" and numerous "Ballet Girls." The former are distinguished for their fine action, while the latter have been his favorite subject since the seventies; he has painted them in a great variety of movements. With age he has become increasingly blasé, taking little interest in natural, normal life. He has scoured the slums of Paris in search of subjects, and has depicted the vicious and degenerate, in so far as they are picturesque. His coloring and brush work are fine. His later work is almost entirely pastel. His composition is daring and original; he does not hesitate to bisect figures, his stage pictures often showing nothing but the heads of the orchestra and the legs of the dancers. Nevertheless, his work is very popular in America as well as in France. The Luxembourg has recently acquired, as a legacy from the painter Caillbotte, a number of his paintings, including the celebrated "Danseuse sur la scène."

DEGEER, de-gār′, Karl, Baron (1720-78). A Swedish entomologist, born at Farspang. He was marshal of the household to the Swedish King and was chosen member of the Academy of Sciences at Stockholm. He is known as the author of a great work on the history of insects, entitled *Mémoires pour servir à l'histoire des insectes* (7 vols., 1752-78).

DE GEER AF FINSPANG, fēn′spång. See Geer af Finspang, Louis Gerhard, Baron de.

DEGEN′ERACY (from *degenerate*, Lat. *degeneratus*, p. p. of *degenerare*, to degenerate, from *de*, down + *genus*, race). The definition given in 1857 by Morel is: "The clearest notion we can form of degeneracy is to regard it as a morbid deviation from an original type. This deviation, even if at the outset it was ever so slight, contained transmissible elements of such a nature that any one having in himself the germs becomes more and more incapable of fulfilling his functions in the world, and mental progress, already checked in his own person, finds itself menaced in his descendants." Morel uses the term to denote the congenital defectives—mental and physical. Degeneracy manifests itself in almost innumerable forms, among which are deformed skulls, paralysis of members, atrophy of various organs, epilepsy, feeble-mindedness, idiocy. Anatomically speaking, the causes of these are certain lesions of the cerebro-spinal axis.

The word normal should be understood as having a relative significance. The man is normal who is best adapted to his environment. The normal savage would soon find his way to the almshouse if suddenly transported to civilized life. In primitive life great variations from the normal are soon weeded out by the ruthless action of natural laws. The feeble-minded soon perish without opportunity of propagating their kind. In advanced society, with its higher regard for life, the defective has a chance to live, and, if society is sufficiently careless, an opportunity to reproduce. Thus the Jukes, a notorious New York family, might have attracted no attention in a hunting society, but living in New York in the nineteenth century, they cost the taxpayers millions of dollars besides the indirect harm of their presence and influence of their example. The individual loses power of adapting himself to changed conditions and sinks lower and lower. The question of degeneracy thus becomes of vital importance to society.

Certain forms of degeneracy are relatively of less social importance, as, for example, minor physical defects, or those monomaniacs who have strange beliefs, grotesque obsessions, great anguish concerning impossible conditions. Indeed, great deviations from the normal may be accompanied by unusual power in some line, as, for instance, the musical gifts of 'Blind Tom.' But these may vary from such incoördinated motor reactions as persistent movements of limbs or face, to kleptomania, impulsion to suicide and homicide. Here the public welfare is again at stake.

The greater degrees of degeneracy are represented by the idiot who merely vegetates. The higher centres are inoperative, the individual totally irresponsible. Among those whose mental functions are in evidence there are still certain physical stigmata. 'The cunning look' of the criminal is proverbial. Lombroso and his followers have sought to classify criminals on this basis. The attempt has not wholly succeeded, but Z. R. Brockway, long superintendent of the Elmira Reformatory, has lately stated his growing conviction that criminals were not normal men physically. Society must in some way discover the line between the normal and responsible and the degenerate and irresponsible. It has become clear that there are born criminals, moral imbeciles. There is a difference between the erotic and the immoral man; the kleptomanic and the thief; the homicide and the assassin. Not until these facts are understood will there be a scientific treatment of the individual who errs.

It is a great misfortune that a man should be born deaf, epileptic, or feeble-minded. It is something more than a misfortune if he is allowed to grow up and transmit his defects. When it is found that children of deaf parents are likely to be deaf, those of the epileptic to have epilepsy, and the offspring of the feeble-minded to resemble their parents, society must call a halt. Without any greater knowledge of the field than we now have, it is plain that this is the first step to take.

The immediate cause of degeneracy may be either individual or social, though the final causes are often beyond our ken. In present society immorality is a fruitful source of degeneracy. All attempts to regulate it have been futile. Of the effect of this vice there has been far too little study. On the best study extant, "The Jukes." Dugdale says: "Fornication, either consanguineous or not, is the backbone of their habits, flanked on the one side by pauperism, on the other by crime. The secondary features are prostitution with its complement of bastardy and its resultant neglected and miseducated childhood; exhaustion with its complement, intemperance, and its resultant, unbalanced minds; and disease with its complement, extinction." Another great cause is intemperance, though the extent of this is often overstated. "It is at once an effect and cause, a symptom and a source of degeneration." Laziness, with its complement idleness, is likewise a potent factor. Among social causes are enforced idleness, accident with its resultant loss of employment, dangerous employments, unhealthful housing conditions, producing weakness tending to dissipation and vice. These causes are perceptible, can be got at, and to a large measure be destroyed. The attempts of Nordau and others to class the genius with the degenerate has not succeeded. See Degeneration as a Factor in Evolution.

Bibliography. Morel, *Traité des dégénérescences* (Paris, 1857); Lombroso, *L'uomo delinquente* (Turin, 1896); Warner, *American Charities* (New York, 1894), of special value from a practical standpoint; Galton, *Hereditary Genius* (New York, 1871); Dugdale, *The Jukes* (New York, 1888); Nordau, *Degeneration* (Eng. trans., New York, 1895). See Pauperism; Penology; Social Debtor Classes.

DEGENERATION (Fr. *dégénération*, from Lat. *degenerare*, to depart from one's race, to degenerate, from *de*, away + *genus*, stock, race, family). In pathology, a term applied to certain tissue changes of a retrogressive character, which are associated with various conditions resulting from age, malnutrition, infectious diseases, poisons, etc. The degenerative process may assume several forms which have been named from their special characteristics. Parenchymatous degeneration, or albuminous degeneration, is the type which most often accompanies the infectious diseases. While any of the cells of the body may be affected, those of the liver, kidney, and the epithelial cells of the mucous membranes, suffer most frequently; the cells become swollen, more granular than normal, and may go on to disintegration. Fatty degeneration is the term used to designate a process by which the protoplasm of the cells of various organs is converted into fat droplets. Under certain conditions tissues, especially those in the walls of blood-vessels, are converted into a homogeneous transparent substance; this form of degeneration is called either hyaline degeneration or amyloid degeneration, according to the microchemical reaction of the substance. The term mucous degeneration is used to designate a form of degeneration affecting both cells and intercellular substance, and in which the protoplasm is transformed into a translucent substance containing mucin. A similar condition in which the new material is more dense and firm is known as colloid degeneration. Under certain conditions, granules of lime cells are deposited in the tissues, and may be so abundant as to make the tissue hard and brittle, or even bony; the condition thus produced is known as calcareous degeneration, or infiltration.

DEGENERATION as a Factor in Evolution. The progressive development of organic forms is from the beginning attended by the modification of organs or of the organism, through lack of nutrition or disuse, resulting in physical degeneracy. We see everywhere throughout the plant and animal kingdoms this process of degeneration, this loss or reduction of parts of organs or entire organs. This is proved by the occurrence of so many vestigial organs or structures in the higher or more specialized plants, and especially animals, as compared with the stem-forms, i.e. the ancestral or generalized forms from which they have apparently descended.

Indeed, there can be no specialization of form and structure without a corresponding reduction of the less useful neighboring parts by partial or total atrophy. To illustrate: The foot of the horse, so wonderfully adapted to the animal's mode of life, consists of a single digit, the other four having disappeared, with the exception of the two splint-bones, which are the relics of two digits. Morphology and paleontology declare in unmistakable terms that the ancestral form from which the horse family has descended was a generalized form provided with five functional toes on each foot. See HORSE; DISUSE.

In groups of animals with a metamorphosis there are exceptional forms in which development is direct, the stages of development being abbreviated or suppressed; the organism may then be said to take a 'short cut' to attain a growth on a level with its allies, who have traveled the long road of development by metamorphosis.

The evolution of almost every type, as well as the process of development of the embryo of most organisms, particularly of the more specialized animals, is a process of development of one part at the expense of another, its hypertrophy, due to accelerated development, resulting from use or exercise and consequent increased nutrition; while adjoining parts, or less desirable or useful parts or organs, are allowed to remain stationary or lapse by atrophy. Adaptation seems not only to involve progressive evolution, but also degeneration. Thus there appears in the growth of the individual as well as in the development or evolution of the race or class to be a competition or struggle for existence, at first between the cells, and afterwards between the different organs, especially those most concerned with the outer world, or with competitive organic forms. The result is that the successful structures receive the most nourishment, while the less useful or favored languish and dwindle, becoming so many vestiges to tell the tale of defeat and death by atrophy.

This is exemplified in the case of such an animal as the lobster. In this animal, and throughout the class of Crustacea, of which it is a type, the wonderful diversity of form in the segments of which the body and limbs are composed, as well as the marvelous degree of specialization of body and limbs characterizing the thousands of species of the class, are due to the excess of development of one over adjoining parts. Thus the huge carapace or shield of the lobster is due to the excessive development of the upper or dorsal portion of two head-segments, the corresponding parts or arches of eleven other segments of the cephalothorax having, during the growth of the animal, become completely lost or atrophied by the continuous pressure of the growing carapace.

The wonderful differences between the mouth-parts of the caterpillar and the butterfly are due to the normal or, in some cases, excessive development of one pair of organs at the expense of others. Thus the mandibles of the caterpillar undergo atrophy in the changes of the chrysalis to the butterfly; the latter, taking no solid food, has entirely lost its mandibles, while the maxillæ forming the tongue are, by exercise in taking nectar, greatly developed, as in the butterfly and especially in the hawk-moth.

So it is with man. As regards his brain and hands he is the most specialized of mammals; but as concerns his feet he is plantigrade, showing a tendency to loss of his little toe by atrophy, while already in the higher race he loses his wisdom teeth soon after they appear. Besides this he bears the vestiges of nearly seventy useless structures, among them the vermiform appendix, the most useless and positively dangerous of these relics pointing to his origin from some more generalized mammal.

The case is similar with the paddles of the ichthyosaurus, the plesiosaurus, and the whales. They are, at least in the last named, the result of modification by degeneration, resulting in adaptation to the medium inhabited. And so it is with the process of evolution of the birds, pterosaurs, and bats, and the modifications in the feet of the male, and in the burrowing insects, climbing lizards, mammals, particularly the lemurs, and the thumbless monkeys.

There are four chief forms of degeneration: (1) Degeneration during the growth of the individual, and the phylogeny of the race or class; (2) degeneration of the individual, more or less total; (3) social and institutional degeneration, often affecting whole peoples, due to slavery, and to mental, moral, and pathological causes; and (4) individual moral degeneration in the human races, resulting in the production of mental degenerates and criminals. It is worthy of observation that the occurrence of atrophy, of degeneracy in man, is nearly everywhere foreshadowed in the rest of the organic world, where it is a normal process, and the necessary complement of progressive evolution.

The death or elimination of the individual member which has become useless or out of harmony with its physical and social environment is also in the course of nature. When once lapsed by atrophy, an organ or part of an organ can never, as a rule, be restored; there are a few exceptions, e.g. that of the pigment of a blind Proteus subjected to light, and the organs of certain plants. The process of degeneration may at an early stage be arrested, but after a certain stage resumption of the original normal structure becomes impossible. Were it not so, evolution would be vastly less progressive than it has been, and the world would be crowded more densely than now with degenerates.

The immediate causes of degeneration are lack of nutrition, disuse, and change of habit and instincts, so that an organ or set of organs are thrown out of use. Atrophy, also, as stated by Demoor, may arise from lack of space, as seen in the reduction in the number of teeth in man compared with lemurs and platyrrhine monkeys, these having six grinding teeth, while man has but five, due to a reduction in the size of the jaw.

Not only do we observe sporadic cases of degeneration, but also species and genera, as well as families, are made up of forms in different stages of degeneration. All parasites, entire classes, as that of sponges, and two classes of worms, as the Trematoda and Cestoida, the crustacean class Cirripedia or barnacles, and the parasitic fish-lice, as well as the parasitic isopods (Bopyridæ), and many insects owe their characteristics to degeneration, while the great order of Diptera are all highly modified by the atrophy of certain parts, their most obvious features being the reduction of the second pair of wings so as to form the 'balancers.' (See FLY.) The forerunners of the true vertebrates, the tunicates, afford a notable instance of the retrogressive development of an entire class.

Enough has been said to show how very general throughout the animal kingdom is modification by partial or total atrophy. The study of animals thus affected throws a flood of light on the factors and causes of progressive evolution.

In mankind, degeneration on a wholesale scale is observed in the effects of slavery and of the slave trade in Africa, where it has been carried on for centuries, and on the master races. The result is that the white race is in a degree pulled down, or deteriorated. A parallel is observable in ant societies, where the service rendered by the enslaved tends to disuse and atrophy in the masters.

In the social evolution of man the joint work of Demoor, Massart, and Vanderville gives a multitude of facts proving that, as among organisms in general, so in human societies, evolution is at once progressive and retrogressive. Existing social forms have during the process of change and modification lost some parts of their structure, and this process of degeneration cannot be regarded as a return to the primitive condition of man. Thus, (1) an institution which has once disappeared in the course of human development never reappears; also, (2) an institution once reduced to the condition of a vestige cannot be reëstablished and resume its former functions; (3) neither can it assume fresh functions. While in the organisms below man degenerative evolution is brought about by a limitation of nutriment, in sociology the cause is a limitation in capital or labor. An institution which has ceased to be functional or useful may survive. These survivals exist here and there, and, as Houzeau has said, "it is to be expected that living and superior civilizations drag behind them a trail of débris from dead civilizations." All this has the most significant bearing on human degeneracy and the study of criminology, especially as to the existence of those pathological, mental, and moral degenerates that appear to live only to afflict struggling humanity.

There are degenerate races, as the Australians, a probable branch of the Dravidian stock of India; the Gypsies, a broken-down low-caste Indian people; the Fuegians, a tribe segregated from the American Indian race. There are also scattered through the most highly developed civilizations physical, mental, and moral degenerates, of which families like that of the James brothers of Missouri, the Juke of the State of New York, or assassins like Booth, Guiteau, and certain Nihilists are examples.

BIBLIOGRAPHY. E. Ray Lankester, *Degeneration* (London, 1880); J. Demoor, J. Massart, and E. Vanderville, *Evolution by Atrophy in Biology and Sociology* (New York, 1899); Morel, *Traité des dégénérescences physiques, intellectuelles et morales de l'espèce humaine* (Paris, 1857); E. S. Talbot, *Degeneracy: Its Causes, Signs, and Results* (New York, 1898).

DEGER, dā'gĕr, ERNST (1809-85). A German painter, born at Bockenem, in Hanover. He studied first at the Berlin Academy under Wach, and then under Schadow, at Düsseldorf. He devoted himself to subjects from religious history and immediately attracted attention by the impressive character of his paintings of religious subjects. They induced Count Fürstenberg to intrust the artist with the decoration of the newly built Church of Saint Apollinaris, near Remagen on the Rhine. Accompanied by Andreas and Karl Müller, and Ittenbach, whom he had chosen as his colaborers, Deger set out for Italy in 1837 to make the necessary studies. After his return in 1841, the frescoes at Remagen were executed within the following ten years, Deger painting those in the choir, which are looked upon as the greatest achievement of the Düsseldorf School in that field. They include the colossal figure of the Redeemer, with the Madonna and John the Baptist on either side, and a number of scenes from the life of Christ. Deger was next commissioned by King Frederick William IV. to decorate the chapel in the Castle of Stolzenfels, near Coblenz, where he painted twelve frescoes, representing the redemption of the human race. After 1869 he was professor at the Düsseldorf Academy.

DEGÉRANDO, de-zhā'räN'dō', JOSEPH MARIE, Baron (1772-1842). A French philosopher, born in Lyons. In 1797 he went to Paris, whence after the 18th Fructidor he fled to Germany. After his return he was secretary-general in the ministry of the interior under Napoleon, and a Councilor of State under the Bourbons. His *De la génération des connaissances humaines* (1802) was crowned by the Academy of Berlin, and his *Histoire comparée des systèmes de philosophie* (2 vols., 1806-07) remains one of the most important of French works on the subject. His *De la bienfaisance publique* (4 vols., 1839) should also be mentioned as among the most elaborate treatises on poor-relief.

DEG'GENDORF. A town of Lower Bavaria, Germany, situated near the Danube, 30 miles northwest of Passau. It is a manufacturing town with woolen mills and breweries (Map: Germany, E 4). Its chief point of interest is the Church of the Holy Sepulchre, a pilgrim resort and the scene of reputed miraculous cures. Population, in 1900, 6843.

DE GOEJE, dā gōō'ye, MICHAEL JAN (1836—). A Dutch Arabist. He was born at Dronryp, Friesland, and was a pupil of the distinguished Arabic scholar Dozy at the University of Leyden. In 1866 he was appointed to the professorship of Arabic at the University of Leyden, and from 1862 to 1878 was prominently engaged as an inspector of schools and promoter of education in Holland. He is editor of a new edition of *Tabari*, and has continued the catalogue of Oriental manuscripts commenced by Reinhart Dozy. Among his numerous publications are the following: *Jakubi*, a description of Africa and Spain; *Beladhori*, a history of the conquest of Syria; the geographical works of *Istakhri*, *Ibn Haukal*, *Mokaddasi*, *Ibn al-Fakih*, *Ibn Khordadbeh*, *Ibn Rosteh*, and *al-Masudi* (in the

Bibliotheca Geographorum Arabicorum, 1870-94); the *Divan* of the poet Moslem Ibn al-Walid; *Biographie de Reinhart Dozy* (trans. by Chauvin, 1883); "A Contribution to the History of the Gypsies," in proceedings of *Koninklijke Akademie van Wetenschappen*, Eng. trans. by Snyders (London, 1886).

DÉGRAS, dá'grá'. A wool grease obtained in the process of oil-tanning of skins and hides, and also from the waters used in wool-scouring. See LEATHER.

DE GRASSE, *de* grás', COMTE. See GRASSE, COMTE DE.

DEGREE (in mathematics). See ANGLE; CIRCLE.

DEGREE. In music, the difference of position or elevation of the notes on the lines and spaces. When notes are on the same line or space, they are on the same degree, even though one of the notes should be raised by a sharp, or lowered by a flat; so c and d♭ are on different degrees, but c and c♯ are said to be on the same degree. Subtracting one from an interval gives the number of degrees which separates the two notes; thus, a third is separated by two degrees; a fourth, by three, etc.

DEGREE. An academic rank or title, originating in the mediæval universities. Scholastic distinctions of an analogous nature seem to have existed in ancient times. The doctors or teachers of the law (*nomodidas kaloi*) and the scribes of the Jews were products of an organized educational scheme, and possessed privileges similar to those conferred by the degree of a teaching doctor in the Middle Ages. In the latter part of the classical Greek period education was well organized into inferior and superior courses, and there evidently existed some recognized proof that such courses had been completed. Greek educational institutions and practices were imitated by the Romans, and Constantinople, Alexandria, and Rome vied with Athens in the support of schools offering elaborate and definite courses of study, the completion of which carried certain distinctions comparable to the modern degree. Historically, however, there is no connection between them. The degree as a university distinction originated at Bologna and Paris during the twelfth century, and, as the titles master and doctor imply, signified at first nothing more than a license to teach. Thus at the University of Paris in its earliest days, the instructors taught by virtue of a *licentia docendi* issued by the chancellor of the cathedral on the Ile de la Cité. This gave them the right to the title of master, the advance from their previous academic rank of bachelor being symbolized by the ceremony of placing the *biretta*, or cap of office, upon their heads by their former instructors.

Of the different university degrees, that of master came first in point of time, being conferred in the twelfth century by the various faculties of the universities in both France and Italy. The title doctor, as an honorary distinction, is not infrequent at this time, usually coupled with some qualifying word; e.g. Thomas Aquinas, Doctor Angelicus. In the thirteenth century the doctor's degree had quite generally replaced the master's in the faculties of law, medicine, and theology, while the master's degree still held its own in the faculty of arts. In the fourteenth century, when many universities began to be founded by virtue of special *privilegia* granted by Pope or Emperor, the right to bestow the doctor's degree was often specifically granted, and in some cases was withheld. Uusally, however, the founding of a university implied the right to confer degrees. Both the Pope and the Emperor had the power to confer the honorary title of doctor, or to delegate this power to others, and the doctors thus created were known as *doctores bullati*, in distinction from the *doctores rite promoti*, those who had successfully undergone the test of the disputation. A candidate for a degree was required to prepare and read a Latin thesis, which he had to defend against a doctor of the faculty, three opponents specially appointed, and, as the phrase ran, 'against all comers.' Disputations, which formed one of the most brilliant and picturesque features of mediæval university life, continued down to a comparatively late period. In England they were not wholly done away with until 1860. The degree of bachelor was first brought into use in the thirteenth century, at the University of Paris and elsewhere, to designate students who had passed certain preliminary tests. In the faculty of philosophy, where the term of study was shortest, it was of comparatively little importance. In Paris, in the fifteenth century, the required period was four years in the faculty of philosophy, seven years in law, eight in medicine, and fourteen in theology; and in these longer courses the preliminary degree conferred certain valuable privileges. At the present day neither the bachelor's degree nor the master's is of any special importance upon the Continent. In France it is granted in each of the different faculties, and every candidate for the degree of Bachelor of Science, Law, Medicine, or Theology must first obtain that of Bachelor of Letters. In Germany some of the universities bestow the degree of bachelor as a preliminary step to that of doctor; but it carries with it no special privilege.

DEGREES IN THE UNITED STATES. At the present time there is a regrettable lack of uniformity throughout the whole system of degrees granted by institutions of learning in the United States. Institutions claiming the right to confer university degrees have multiplied so rapidly within recent years, and there is frequently so wide a disparity in their standards, that the value of a degree is a highly variable quantity. In general, it may be said that the lowest, or bachelor's degree, stands for four years of college work; that the second, or master's degree, is granted after not less than one year of specialized study in a graduate department; and that the doctor's degree is bestowed after two or three years of specialized study and the preparation of a thesis upon some subject approved by the faculty. Even among the elder universities, however, and those of the highest standards, there is considerable divergence in the significance of the several degrees. That of A.B., for instance, no longer stands, as it once did, for a definite amount of Latin and Greek and mathematics. The steady growth of the elective system and the tendency to substitute modern languages for the classics have forced upon the universities the alternative of either changing the requirements for the degree or else conferring a different degree in place of it. Yale, Princeton, and the Universities of Pennsylvania, Western Reserve, Chicago, Michigan, Wisconsin, Colorado, and California are among those that still maintain the old classic requirements for the A.B., while among those that no longer require Greek are Harvard, Columbia, Cornell, and the Universities of Virginia, Indiana, Illinois, Kansas, and Nebraska. Many American colleges offer several parallel courses, leading to the degrees of Bachelor of Arts, of Letters, of Philosophy, and of Science; and in these institutions there are usually corresponding master's degrees—M.A., M.Lit., M.Ph., and M.S. In the faculties of medicine, law, and theology there is not the variety of degrees found in the faculties of philosophy and science. The medical schools regularly grant the doctor's degree alone; while the divinity and law schools usually give only the bachelor's degree. The higher legal degrees, however, are granted by just a few law schools, such as Yale, which confers the degrees of LL.M. and D.C.L. as the result of certain required studies, and the University of Chicago, which already confers the degree of J.D. The indiscriminate and ill-advised bestowal of honorary degrees is another cause that contributes to lessen the value of American degrees. Not only those degrees which are properly honorary, such as the D.D. and LL.D., are often bestowed by smaller colleges upon insufficient grounds, but other degrees which should regularly be won only by a definite course of study are conferred as honorary degrees, such as the Ph.D., the M.A., and even the bachelor's degree. Recently, however, a reaction has set in, and steps are being taken to check the granting of degrees out of course excepting such as are generally recognized as honorary degrees. See Bachelor's Degree; Doctor; Doctors of the Church; **Elective Studies**; **Master of Arts**; University.

List of the More Usual Degrees.

A.A., Associate of Arts.
A.B. or B.A., Bachelor of Arts.
A.M. or M.A. (*Artium Magister*), Master of Arts.
B.C.L., Bachelor of Civil Law.
B.D., Bachelor of Divinity.
B.L. or Litt.B., Bachelor of Letters.
B.LL. or LL.B. (*Legum Baccalaureus*), Bachelor of Laws.
B.P., B.Ph., or Ph.B., Bachelor of Philosophy.
B.S. or B.Sc., Bachelor of Science.
C.E., Civil Engineer.
C.M. (*Chirurgiæ Magister*), Master in Surgery.
D.C.L., Doctor of Civil Law.
D.D., Doctor of Divinity.
D.Litt. or Litt.D., Doctor of Literature.
D.M., Doctor of Medicine (Oxford).
D.M.D. (*Dentariæ Medicinæ Doctor*), Doctor of Medical Dentistry.
D.V.M., Doctor of Veterinary Medicine.
D.S. or D.Sc., Doctor of Science.
E.E., Electrical Engineer.
J.D. (*Juris Doctor*), Doctor of Law.
J.U.D. (*Juris Utriusque Doctor*), Doctor of Civil and Canon Law.
L.H.D., Doctor of Letters, or Humanities.
LL.B. (*Legum Baccalaureus*), Bachelor of Laws.
LL.D. (*Legum Doctor*), Doctor of Laws.
LL.M. or M.L. (*Legum Magister*), Master of Laws.
M.B. (*Medicinæ Baccalaureus*), Bachelor of Medicine.
M.C.E., Master of Civil Engineering.
M.D. (*Medicinæ Doctor*), Doctor of Medicine.
M.M.E., Master of Mining Engineering.
Mus.B., Bachelor of Music.
Mus.D., Doctor of Music.
Ph.D. (*Philosophiæ Doctor*), Doctor of Philosophy.
Ph.G., Graduate in Pharmacy.
V.S., Veterinary Surgeon.

The origin of a special costume to designate members and graduates of universities is obscure, and probably was not in the first instance at all formal or conscious, but a mere adaptation of monastic costume. In the days when it was first used, long and flowing robes were commonly worn by all classes of people; the university, like the Church, only preserved a tradition which died out in the world. The advantages of a distinctive costume were probably recognized at an early date. Two of the most obvious are the equalization of rich and poor under a simple uniform gown, and the provision of a means of identifying students. This latter view probably counts for something in the rule still in force at Oxford and Cambridge, which forbids undergraduates to appear in the streets without academic costume in the morning or evening. Gowns were at first all black, but distinctions of social rank were later expressed by them, and the sons of noblemen in England were permitted in the thirteenth century to wear gowns of any color. A skull-cap was allowed to ecclesiastics to protect the tonsured head, and, except the hood, this is the only headdress recognized by early university statutes. This *pileus* soon assumed a pointed shape, and in this form was recognized as one of the insignia of the doctorate. The central point developed afterwards into the modern tassel. Bachelors wore no official headdress. The hood, which was worn by undergraduates until the sixteenth century, was originally attached to the gown, like the cowl of the monastic habit. Later it became a separate article of dress, which by its shape or color denoted the academic rank of the wearer. The English and Scotch universities have long maintained a definite system of hoods, which differ in each institution. Thus the bachelor's hood in Oxford and Cambridge is trimmed with white fur; the M.A. hood of Oxford is lined with crimson, and at Cambridge with white silk; the Oxford D.D. is of scarlet cloth, lined with black, the Cambridge of scarlet, lined with pink; the Oxford D.C.L. of scarlet cloth lined with crimson silk, the Cambridge LL.D. with pink silk. Clergymen who are literates — i.e. ordained without an academic degree—are allowed to wear a hood or tippet of plain black silk over their surplices. Gowns are not worn by undergraduates in the German universities—in fact, they are practically appropriated to the rector and deans of faculties, and by them worn only on the most solemn occasions.

The wearing of cap and gown in America was comparatively rare until the last quarter of the nineteenth century. A movement toward a general adoption of a uniform system resulted in the calling of an intercollegiate commission, which met in 1894 at Columbia College, under the chairmanship of President Low, Yale, Princeton, and New York University being also represented. Their report, made a year later, was adopted by many colleges, as offering a simple, adaptable, and intelligible system. It provides for three types of gowns and of hoods—for bachelors, masters, and doctors. The bachelor's gown has long, pointed sleeves; the master's a long, closed sleeve square at the end, falling below the knee; the doctor's resembles the familiar pulpit or judge's gown, with full, round, open sleeves, and is faced with velvet, of which it also bears three bars on the sleeves. The two latter are of silk, the bachelor's of worsted stuff. These distinctions in gowns follow closely the English usage; the system of hoods is a piece of original constructive legislation, there being three distinct forms for bachelor, master, and doctor, lined with silk of the official colors of the institution granting the degree, and trimmed with velvet of the color that represents the department of learning in which it is conferred. The following are the colors used for this purpose: Arts and letters, white; theology, scarlet; laws, purple; philosophy, blue; science, gold yellow; fine arts, brown; medicine, green; music, pink; pharmacy, olive; dentistry, lilac; forestry, russet; veterinary science, gray; and library science, lemon. In connection with this system, it is customary for those who hold degrees from German universities to line their hoods with the colors of the university granting them, upon which is laid a German tri-chevron of black, white, and red.

DEGREE OF LATITUDE. A space along the meridian (q.v.), through which an observer must pass to alter his latitude by one degree—i.e. in order to see a star in the meridian one degree nearer to or farther from the zenith. (See Latitude.) The length of a degree must be calculated from data found by actual measurements on the earth's surface; and owing to the earth being an oblate spheroid, and not a sphere, it varies with the place of observation, the degrees being longer toward the poles, where the earth is flatter, and shorter at the equator, where the earth is more curved. If the earth were a sphere, a degree would have a constant length. As it is, a degree at the equator contains 362,756.5 feet, while at the latitude 40° it is increased to 364,283.7 feet. From a variety of observations conducted at various times and places, from as far back as the time of Eratosthenes (about B.C. 225), tables have been constructed showing the length of degrees at different latitudes. The length of 'the middle degree,' as it is called, or that of places in latitude 45°, is 364,606.0 feet. The ascertained difference between degrees of latitude is one of the proofs of the earth's spheroidicity. See Geodesy.

DEGREE OF LONGITUDE. The space between two longitude meridians that make an angle of 1° at the poles, measured on the arc of a circle parallel to the equator passing between them. It is clear that this space is greatest at the equator, and becomes zero at the poles; and it can be shown that it varies with the cosine of the latitude, if the earth be regarded as a sphere. The annexed table shows the lengths of a degree of longitude for every tenth degree of latitude from 0° to 70°, and takes account of the earth's divergence from a spherical form.

Latitude	Length of degree in feet	Latitude	Length of degree in feet
0°	365,228.6	40°	280,173.5
10°	359,716.7	50°	235,232.3
20°	343,338.5	60°	183,079.8
30°	316,565.3	70°	125,290.4

DEGREES, Lambeth. By act of Parliament in the twenty-fifth year of Henry VIII., sundry powers formerly belonging to the Pope were conferred upon the Archbishop of Canterbury, among which was the right of granting all the degrees taken in the universities of Oxford and Cambridge, and to this day he occasionally grants them, *honoris causa*. They are known as Lambeth degrees, from Lambeth Palace, London, his official residence.

DE HAAS, de häs, Maurice Frederick Hendrick (1832-95). A Dutch marine painter. He was born in Rotterdam; first studied at the Academy there, and in 1851 went to London, where for a year he devoted himself to painting in water colors. After a sketching tour on the English and Dutch coasts, he became a pupil of Louis Meyer at The Hague. In 1859 he emigrated to New York, where he soon gained a high reputation. He was one of the original members of the American Society of Painters in Water Colors, in 1866, and in 1867 became an academician. His best-known American picture is "Farragut Passing the Forts." Some of his other pictures are: "Storm Off the Isle of Jersey;" "After the Wreck;" "White Island Lighthouse;" and "The Rapids Above Niagara." His brother, William Frederick (1830-80), settled in New York in 1854, and also distinguished himself as a marine painter. He painted: "Sunrise on the Susquehanna;" "Fishing-Boats off Mount Desert;" "Evening at Halifax;" and "Narragansett Pier."

DEHN, dān, Siegfried Wilhelm (1799-1858). A German musical theorist, born at Altona. He became favorably known through his editions of the works of Orlando Lasso (*Seven Penitential Psalms,* 1838) and other early composers. He was custodian of the musical department of the Royal Library, Berlin, after 1842, and in 1849 was appointed professor. Among his numerous distinguished pupils in musical theory were Kiel, Glinka, Rubinstein, and Theodor Kullak. His principal publication is the *Theoretische-praktische Harmonielehre* (2d ed. 1858).

DEHODENCQ, då'ŏ'dänk', Edme Alfred Alexis (1822-82). A French genre portrait and historical painter, born in Paris. He studied at the Ecole des Beaux-Arts, under Léon Cogniet. His reputation rests principally upon his Spanish and Oriental pictures, and he is one of the most original of the group of French painters who treat such subjects. His pictures are notable for ethnographical accuracy, vivacity, and glowing color. In this genre are: "A Bull Fight in Spain" (1850); "A Jewish Fête at Tangiers" (1865); and "A Story-Teller of Morocco" (1878). After his return to France he painted his "October Morning," in the Luxembourg (1872)—an attempt to treat a Parisian scene with the brush of an Orientalist. He also executed a number of portraits.

DEHORNING (a word of hybrid formation, from Lat. *de,* away from + Engl. *horn*). The practice of dehorning cattle has been in vogue in Europe and the United States for many years. From time to time there has been much controversy as to the advisability and alleged cruelty of the operation. Dehorning is quite generally advocated by all who have tried it. Special dehorning shears or clippers have been devised which enable the operator to remove the horns quickly and with a minimum amount of pain. The animals recover from the operation in a few days, without serious loss of flesh or decrease in milk production. Dehorned animals are much less liable to injure one another, especially in transportation. Cattle with quarrelsome or vicious disposition are rendered docile and gentle. The operation should be performed in mild weather, and not during periods of extreme cold or in fly-time.

The growth of horn may be entirely prevented by the application of caustic potash to the horn-button as soon as it can be discovered on the calf's head, or about three or four days after birth. In applying caustic potash the hair should be clipped from the head so as to expose the developing horn. The latter may be moistened with ammonia, so as to dissolve the oily skin secretion. A stick of caustic potash should then be moistened in water and rubbed on the horn. The operation should be repeated until the horn becomes somewhat sensitive. The process requires only a few minutes. A scab forms over the treated surface, and falls off after a period of about one month, leaving a smooth poll on which the horns never develop.

DEHRA DUN, dĕ′rȧ dụn. The capital of a district of the same name in the Northwest Provinces, British India, seventy-five miles east of Ambala. It is picturesquely situated in a mountain valley at an altitude of 2300 feet. Its principal buildings are the seventeenth-century temple of Guru Ram Rai, an Anglican church, and an American Presbyterian mission establishment. The town is the seat of a military cantonment, of Government survey, and of forestry departments. Population, in 1891, 25,684; in 1901, 28,095.

DEIANI′RA (Gk. *Δηϊάνειρα, Dēianeira*). In Greek mythology, the daughter of Œneus, King of Calydon in Ætolia, and of Althæa. She became the wife of Hercules, who was victorious over Achelous in a contest for her possession, and bore him a son, Hyllus. She unintentionally caused Hercules's death by giving him the poisoned shirt of Nessus, and in her grief over it took her own life.

DEI GRATIA, dē′ī grā′shĭ-ȧ (Lat., by the grace of God). A formula found a number of times in the epistles of the New Testament. Pope Felix II., in 356, used "*per gratiam dei episcopus.*" It was formally used by the bishops at the Council of Ephesus, in 431. Later it was commonly used by archbishops, bishops, abbots, and others in their correspondence. After the middle of the thirteenth century, when the sanction of the Pope was considered important for an ecclesiastical appointment, the higher clergy wrote, "*Dei et Apostolicæ Sedis Gratia*" ("by the grace of God and of the apostolic see"). Other expressions were also used, as "*Christi nomine,*" "*miseratione divina,*" "*permissione divina,*" etc. In England the usage was largely dropped about the time of the Reformation. Occasionally, however, the archbishops of Canterbury and York used the form until the seventeenth century. The expression was used by temporal princes as early as the seventh century. Rothar uses "*in Dei nomine.*" Ethelbert of England, in the charter of 605, styles himself "*Æthilbertus Dei Gratia Rex Anglorum.*" From the time of Pepin the form was commonly used by the Frankish kings. Charles VII. of France regarded *Dei Gratia* as a royal title, and forbade its use by the Count d'Armagnac. The phrase is used on coins of many nationalities.

DE IM′ITATIO′NE CHRIS′TI. See KEMPIS, THOMAS À.

DEINHARDSTEIN, dīn′härt-stīn, JOHANN LUDWIG (1794-1859). A German dramatist, born and educated in Vienna. He was vice-director of the Hofburg Theatre, Vienna, from 1832 to 1841, and editor of the *Jahrbücher der Litteratur* from 1829 to 1849, during which period this publication counted among its contributors men like W. von Humboldt, A. W. Schlegel, Rückert, and Hebbel. His *Künstlerdramen* (2 vols., Leipzig, 1845), treating of the dramatic episodes in the lives of artists and actors, may be said to have established in some respects a new dramatic genre in Germany. Among his best plays may be mentioned: *Hans Sachs; Floretta;* and *Garrick in Bristol.* His collected works, comprising seven volumes, were published in Leipzig (1848-57), under the title *Gesammelte dramatische Werke.*

DEI′NOTHE′RIUM. See DINOTHERIUM.

DEIO′CES (Lat., from Gk. *Δηϊόκης, Dēiokēs*, Assyr. *Dayaukku*, connected ultimately with Av. *dainhupati*, Arm. *dephet*, lord of the land). According to Herodotus, the first ruler of the Empire of the Medes. After the Median revolt from Assyria, he rose to be chieftain of his own petty village, and later was chosen king. He built Ecbatana, and ruled, in true Eastern style, by means of informers and spies.

DE′IOT′ARUS (*Δηϊόταρος, Dēiotaros*). A king of Galatia in the first century B.C. He formed an alliance with the Romans against Mithridates, and with several hundred horsemen defended the cause of Pompey at Pharsalia (B.C. 48), and afterwards fled with the latter. Several years later he was accused of aiding Cæcilius Bassus and of conspiring against Cæsar, but was exonerated after the famous tribute paid to him by Cicero in the oration entitled *Pro Rege Deiotaro.* He aided Brutus at the battle of Philippi, and afterwards took sides with Octavius against Antony.

DEIPH′OBE (*Δηϊφόβη*). In Greek mythology, a daughter of Glaucus and priestess of Apollo and Artemis. Apollo granted her to live seven hundred years, but she neglected to ask for everlasting youth, and at length lost her powers and vanished away. She lived in a cabin near Cumæ, and was the guide of Æneas to the under world. She was said to be identical with the sibyl who sold the Sibylline Books to Tarquin.

DEIPH′OBUS (Gk. *Δηΐφοβος, Dēiphobos*). In Greek legend, the son of Priam and Hecuba, and one of the bravest of the Trojan heroes. After the death of Paris he married Helen, and she, after the fall of Troy, gave him up to Menelaus, her former husband, by whom he was killed and mutilated.

DE′IRA. An ancient kingdom of Britain, corresponding closely to the modern Yorkshire. It formed a part of Roman Britain, and the town of York was the capital and seat of the Roman prefect. Ælla, a chief of the Angles, took possession of Deira about the middle of the sixth century. There was constant strife between Deira and its northern neighbor, Bernicia, which delayed the full conquest of northern Britain. Æthelfrith of Bernicia drove out Ælla's son in 588, and united the two kingdoms under the name Northumbria. In 603 the forces of the North Britons were annihilated at the Dægestan, and the rule of Northumbria was established from the Humber to the Forth. In 627 Christianity was accepted. Bernicia and

Deira became separate kingdoms about 633, but were reunited in 651. Later Deira was a separate kingdom under the Danes. It was a number of native prisoners of Deira, exposed for sale in the slave market at Rome, that attracted the attention of Gregory I. and led to the Christianizing of Britain, according to the old legend.

DEIR-EL-BAHRI, dār el-bä′rē (northern convent). The modern Arabic name of a famous Egyptian temple near the site of the ancient Thebes (q.v.). It was built by Queen Hatshepsut (Hatasu), the sister and wife of Thothmes II., but was never completed. In Christian times it became a monastery, whence its modern name; and the reliefs adorning the walls were badly mutilated by zealous monks, who regarded them as remnants of heathenism. The temple was dedicated to the god Ammon of Thebes, and also contained chapels for the deities Athor and Anubis, as well as a funerary chapel for Queen Hatshepsut. It is built upon three terraces rising in successive steps from the plain, each containing a court with columned porticoes and other buildings. The principal buildings surround the upper court, at the rear of which is the sanctuary. The walls of the various halls and chapels are magnificently decorated with sculptures and paintings. In one of the halls is depicted the fleet sent by Queen Hatshepsut to Punt, on the Somali coast. (See EGYPT, *History.*) The site was examined by Mariette, and later Naville, acting under the auspices of the Egypt Exploration Fund, cleared the whole temple of rubbish and explored it systematically. In 1881 no fewer than thirty-nine mummies and coffins of kings and members of the royal house were found in a deep, rocky pit near Deir-el-Bahri and removed to the Bulak Museum. Among the mummies found were those of Seqenen-Rē, Amasis I., Amenophis I., Thothmes II., Thothmes III., Seti I., Rameses I., and Rameses II. Consult: Mariette, *Dier-el-Bahri* (Leipzig, 1877); Dümichen, *Flotte einer ägyptischen Königin* (Leipzig, 1868); *Egypt Exploration Fund Memoirs*, vols. xii.-xiv., xvi. (London, 1894 et seq.); *Guide to the Temple of Deir-el-Bahri*, published by the Egyptian Exploration Fund (London).

DEIR-EL-KAMAR, el-kä′mẽr, or DER-EL-KAMAR (Ar., monastery of the moon). A town of Syria and once the seat of Emir Beshir, the chief sheik of the Druses (Map: Palestine, B 1). It is picturesquely situated in a glen of Mount Lebanon, at an altitude of over 2800 feet, about 13 miles from Beirut. The chief industry is the production of silk stuffs and embroideries. Population, about 8000, chiefly Maronites. Deir-el-Kamar has been the centre of many conflicts between the Maronites and the Druses.

DE′ISM (Fr. *déisme*, from Lat. deus, god), or THEISM (Fr. *théisme*, from Gk. θεός, *theos*, god). A term which properly means belief in a god, or opposed to atheism. In common language, however, deism is opposed to belief in a revelation, and a deist is one who holds the existence and providence of God, but grounds his belief on reason and the evidence afforded by the constitution of things, and rejects the testimony of a revelation. The name is often used vaguely by way of reproach, similarly to 'infidel.'

The term deists, or freethinkers, is sometimes used to designate a school or series of writers who appeared in England in the seventeenth and eighteenth centuries, and who aimed at establishing what they called natural religion, upon the basis of reason and free inquiry, and then bringing all positive or revealed religion to the test of this. They are looked upon as the precursors of German rationalism in theology. The leading names in this school are: Lord Herbert of Cherbury (died 1648); John Toland, whose *Christianity Not Mysterious* (London, 1696) gave exact expression to the tendency of the deists; the third Earl of Shaftesbury; Anthony Collins (died 1729), the friend of Locke; Thomas Woolston; Matthew Tindal, the author of *Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature* (London, 1730); Viscount Bolingbroke. Consult: A. S. Farrar, *History of Free Thought* (London, 1863); Leslie Stephen, *History of English Thought in the Eighteenth Century* (London, 1881).

DÉJAZET, dā′zhä′zā′, PAULINE VIRGINIE (1797-1875). A celebrated French actress. She was born in Paris, August 30, 1797 (some accounts say 1798). From the time she was five years old, when she began playing children's parts with marvelous precocity of intelligence and grace, till she was over seventy, her career upon the stage was an almost uninterrupted success. After experience in several Parisian theatres, she went to Lyons and Bordeaux, where she won great popularity in soubrette rôles. Returning to Paris (1820), she played successively at the Gymnase, the Nouveautés, and the Palais Royal, where she made some of her greatest hits in young men's parts. These, called *rôles travestis*, were so distinctive that they, together with her quick-witted soubrette rôles, came to be known as a class by themselves, *Déjazets*. Famous especially were her impersonations in *La petite sœur; Le plus beau jour de la vie; Le fils de l'homme; Sophie Arnould; Frétillon;* and numerous others. After 1845 she played for a time at the Variétés, and made successful tours abroad. In 1859, with her son Eugène, she undertook the management of the Folies-Nouvelles, then known as the Théâtre Déjazet. Here she brought out several of Sardou's earlier pieces, among them *Monsieur Garat* and *Les prés Saint-Gervais*. She retired from the stage in 1868, but appeared again even within a year of her death, which occurred December 1, 1875. Countless stories are told of her brilliant wit and personal charm. Consult: Duval, *Virginie Déjazet, 1797-1875* (Paris, 1876); Lecomte, *Virginie Déjazet: étude biographique* (Paris, 1866); and Mirecourt, "Déjazet," in *Les contemporains* (Paris, 1854).

DEJEAN, de-zhäN′, JEAN FRANÇOIS AIMÉ, Count (1749-1824). A French general and statesman, born at Castelnaudary. He fought with distinction in the wars of the Revolution, rising successively to the rank of brigadier-general and general of division. He was Minister of War from 1802 to 1807, and, after the first Restoration, was appointed governor of the Polytechnic School. Upon the return of Napoleon from Elba, he rendered valuable services until after the battle of Waterloo. He was also for a time grand chancellor of the Legion of Honor.

DEJEAN, PIERRE FRANÇOIS AIMÉ AUGUSTE, Comte (1780-1845). A French general and entomologist, son of the preceding. He was born at Amiens, and took up the study of medicine, but soon entered Napoleon's army, with which he went to Spain and to Russia. In the army he attained the rank of a general of division, and at Waterloo acted as adjutant to the Emperor. Devoting all his leisure to science, Dejean made extensive collections of insects, and contributed much to our knowledge of Coleoptera (beetles). He is the author of the following works: *Iconographie des coléoptères d'Europe* (1829-36); *Espèces générales des coléoptères* (1825-37); and *Histoire naturelle et iconographie des coléoptères d'Europe*. The last-named work is still a standard on the subject of Coleoptera. The works were written by Dejean in conjunction with Boisduval and Aubé.

DE KALB. A city in De Kalb County, Ill., 58 miles west of Chicago; on the Chicago Great Western Railroad (Map: Illinois, D 2). It is the seat of the Northern Illinois State Normal School. The city contains barbed-wire factories, wire-drawing and woven-wire mills, agricultural-implement works, piano, shoe, glove, mitten, and creamery package factories, etc. The government is administered by a mayor, biennially elected, and a municipal council. The city owns and operates its water-works. Settled about 1838, De Kalb was incorporated in 1877. Population, in 1890, 2579; in 1900, 5904.

DE KALB, BARON. See KALB, JOHANN, Baron de.

DE KAY, CHARLES (1848—). An American author. He was born in Washington, and graduated at Yale University in 1868. He was associated with the New York *Times* as literary and art editor from 1877 to 1892, and two years later was appointed consul-general of the United States at Berlin, where he remained until 1897. During his sojourn abroad he established the Berliner Fechtklub, after previously founding a similar society (the Fencers' Club) in New York (1882). Among the literary and art societies established by him are the Authors' Club (1882), the National Sculpture Society (New York, 1892), and the National Arts Club (New York, 1899), of which he became the managing director. Among his numerous publications are the following: *Hesperus and Other Poems* (1880); *Vision of Nimrod*, a dramatic poem (1881); *Bird Gods*, devoted to ancient European mythology and religion (1898); *Essays on Ancient Ireland; Love Poems of Louis Barnevel* (pen-name) (1883); and translations of Heinrich Heine's *Letters* and of several works from the French.

DEKEN, dā′kĕn, AGATHE (1741-1804). A Dutch poet and novelist, born at Amstelveen. Many of her works were written in collaboration with her friend Elizabeth Bekker. These joint productions include the novels: *Historie van Sara Burgerhart* (1782); *Historie van Willem Levend* (1875); *Brieven von Abraham Blankaart* (1787); and *Historie van Cornelia Wildschut* (1793). Her religious songs show her to have been possessed of a truly pious nature, while her descriptive poems are fine characterizations of the folk life of Holland. Especially noteworthy are the collections entitled *Liederen voor den boerenstand* (1804) and *Liederen voor Kinderen*.

DEK′KER, EDUARD DOUWES (1820-87). A Dutch writer, the author of *Max Havelaar* (1860), the Dutch *Uncle Tom's Cabin*. He was born in Amsterdam, March 2, 1820. He went in 1838 to the Dutch Indian colonies, and remained eighteen years in Government employ, endeavoring to mitigate the evils of native government, and resigning in 1856 because his zeal clashed with Government interest. Then he made his appeal to the public conscience in *Max Havelaar*, revealing conditions of outrageous and inhuman extortion, but getting little sympathy and no redress for the victims. In 1866 he withdrew to Germany, where he published (in Dutch) a popular drama, *Vorstenschool* (*The School for Princes*); a novel, *La Sainte Vierge;* and several studies in political and social economy. He is well known by his pseudonym, Multatuli. The posthumous *Geschiedenis van Wouterje Pieterse* (1888), incomplete, was followed in 1892 by *Letters* and *Works*, edited by his widow.

DEKKER, THOMAS (c.1570-c.1641). An English dramatist. He was born in London. His dramatic career began as early as 1597, and before his death he wrote, single-handed or in collaboration, more than forty plays. In 1600 were printed two of his best comedies—*The Shoemaker's Holiday* and *Old Fortunatus*. The latter contains scenes and passages of very great beauty. Dekker had been writing the previous year in conjunction with Ben Jonson, but the two dramatists had now fallen out. In 1601 Jonson ridiculed Dekker in *The Poetaster*. Dekker replied with *Satiromastix, or the Untrussing of the Humourous Poet* (1602). Of the plays that Dekker wrote after that, the most powerful is *The Honest Whore* (two parts, 1st part printed 1604; 2d part, 1630), in the composition of which he was aided by Middleton. Other plays in which Dekker bore a hand are: *Black Bateman of the North* (1598); *The Roaring Girl* (1611); *The Virgin Martyr* (1622); and *The Witch of Edmonton* (first published 1658). He wrought with a realistic aim, describing the middle and lower strata of London life. He also wrote several noteworthy pamphlets, of which *The Gull's Hornbook* (1609) is the best extant account of the London gallants. Other pamphlets deal with thieves and vagabonds; another, *The Wonderful Year* (1603), describes London suffering from the plague. Consult: *Dramatic Works*, edited by Shepherd (4 vols., London, 1873); *Plays* (selected), edited by Rhys (London, 1887); and *Non-dramatic Works*, edited by Grosart (5 vols., London, 1884-86).

DE KO′VEN, HENRY LOUIS REGINALD (1861—). An American composer of songs and light operas, born in Middletown, Conn. When eleven years old he was taken to Europe, where he received his education. He was graduated from Saint John's College, Oxford, in 1879. After he had been instructed in the usual musical grounding branches by Speidel, Lebert, and Pruckner, in Stuttgart, and Hauff in Frankfort, he took a course in vocalization with Vanuccini in Florence, and courses in light-opera composition with Genée, Von Suppé, and Delibes. On his return from Europe in 1882 he took up his residence in Chicago, but subsequently moved to

New York and afterwards to Washington. His scores are melodious and show refinement of instrumental coloring and harmony. His greatest success has been *Robin Hood* (1890), a thoroughly delightful work of its kind. Others among his light operas are: *The Begum* (1887); *The Fencing Master* (1892); *Rob Roy* (1894); *The Highwayman* (1897); *The Three Dragoons* (1899); *Foxy Quiller* (1900); and *Maid Marian* (1901). He has also composed many songs, several of which have become well known.

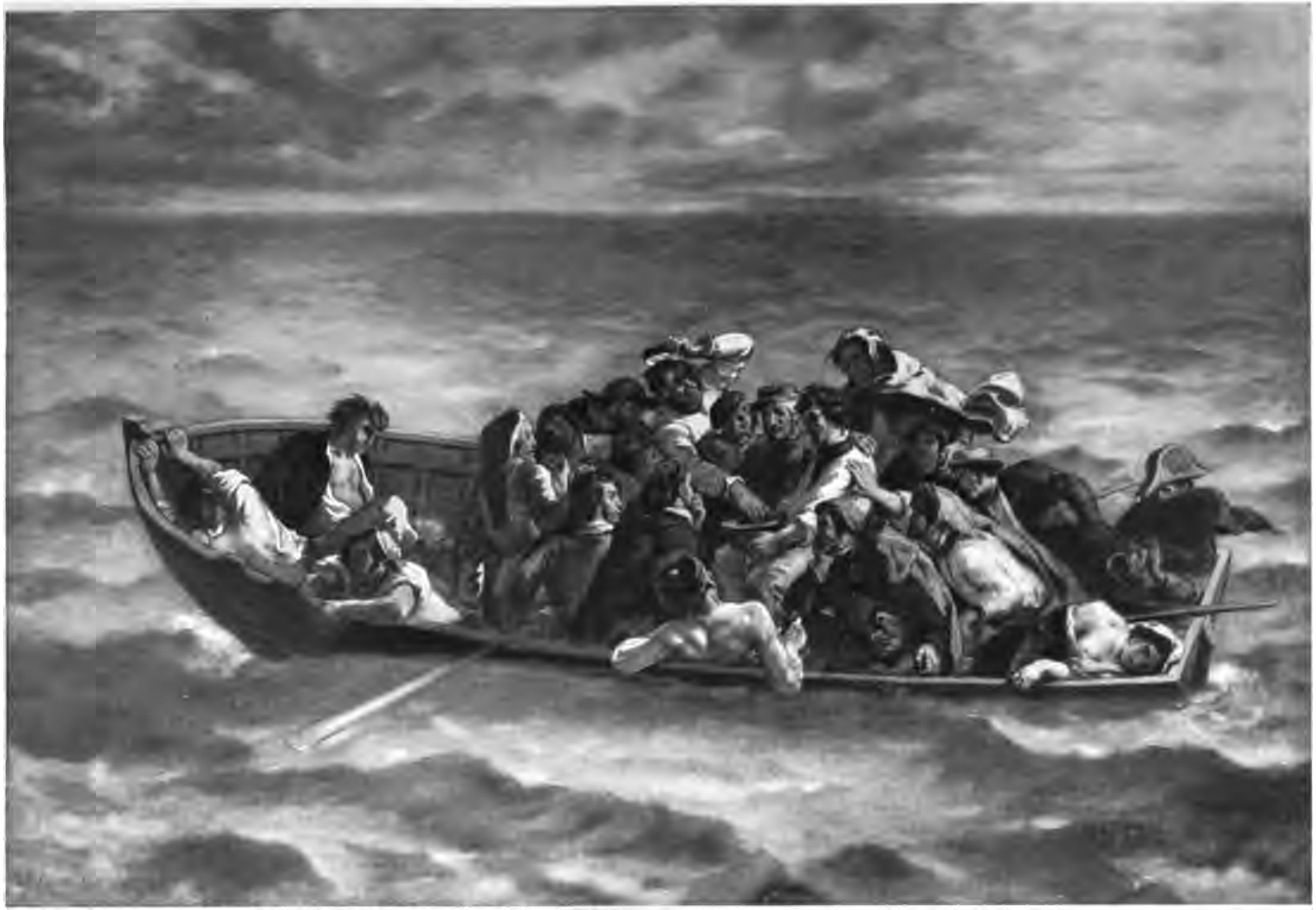
DELABARRE-DUPARCQ′, de-lȧ'bär′ dụ'-pärk′, NICOLAS EDOUARD (1819-93). A French military critic and historian, born at Saint Cloud, Seine-et-Oise. He studied at the Ecole Polytechnique, and in 1849 was appointed professor of military history at the College of Saint-Cyr. Having entered the engineers in 1841, he rose in 1871 to the rank of colonel, and was retired in 1879. He wrote, in addition to numerous memoirs for the Academy of Moral and Political Sciences, *Biogrophie et maximes de Maurice de Saxe* (1851); *Portraits militaires, Esquisses historiques et stratégiques* (2 vols., 1853-55); *Les chiens de guerre* (1867); *Histoire de Henri IV., roi de France et de Navarre* (1884); and many other works.

DE LA BÈCHE, de lȧ bāsh, Sir HENRY THOMAS (1796-1855). A distinguished British geologist. He was born near London, and educated at the military school at Great Marlowe. He entered the army in 1814, but soon retired from public service to take up the study of science. For several years he traveled through England, France, and Switzerland, examining the geological formations and gaining a knowledge of mineralogy and petrography. His researches were the bases of frequent contributions to the *Transactions of the Geological Society*, in which he displayed great scientific ability. He was the first to conceive the plan of making a detailed geological map of England, a task he commenced upon his own responsibility; in 1832 the expense of this work was assumed by the Government, and De la Beche was appointed director. He labored for many years to establish the survey on a successful basis, and he was also concerned in founding a geological museum and a school of mines in London. The list of his publications includes many books recognized as standard works of reference and numerous papers contributed to scientific journals; among the more important are the following: *Manual of Geology* (1831); *Researches in Theoretical Geology* (1834); *Report on the Geology of Cornwall, Devon, and West Somerset* (1839); *On the Formation of the Rocks of South Wales* (1846); and *Geological Observer* (1853). De la Beche was elected president of the Geological Society of London in 1847, and in 1855 he received the Wollaston medal from the same society. His distinguished services were also awarded by the bestowal of knighthood and by numerous marks of honor from foreign societies.

DELABORDE, de-lȧ'bōrd′, HENRI, Count (1811-99). A French art critic and historical painter, born in Rennes, son of Count Henri François Delaborde. He studied for some time in Paris with Delaroche, and afterwards produced historical pictures of a rather conventional type. Among them are: "Hagar in the Desert" (1836); "Saint Augustine" (1837); and "The Knights of Saint John of Jerusalem" (1845), at Versailles. But he is known principally as a critic of art. Besides his writings, as perpetual secretary of the Académie des Beaux-Arts, he contributed to the *Revue des Deux Mondes* and other periodicals. These articles have been collected as *Mélanges sur l'art contemporain* (1866), and *Etudes sur les beaux-arts en France et en Italie* (1864). He also assisted Charles Blanc in preparing his *History of Painters*, and published, among other volumes, *Ingres, sa vie, ses travaux, sa doctrine* (1870); *Lettres et pensées d'Hippolyte Flandrin* (1865); *Gérard Edelinck* (1886); *La gravure* (1882); and *La gravure en Italie* (1883). He became an officer of the Legion of Honor in 1870.

DELABORDE, HENRI FRANÇOIS (1764-1830), Count. A French soldier, born in Paris. He successively became a brigadier-general, chief of staff, and commander in Corsica. As a general of division he conducted the campaigns in the Pyrenees (1794) and on the Rhine. In 1812 he was a general of division in Mortier's "Jeune Garde," which fought so gallantly in the Russian campaign. Upon the return of Napoleon from Elba he again espoused the cause of the Emperor. With the advent of the Restoration he was brought before a military tribunal (September, 1816), but acquitted.

DELACROIX, de-lȧ'krwä′, FERDINAND VICTOR EUGÈNE (1799-1863). A French painter, an important leader of the modern Romantic School. He was born at Charenton-Saint-Maurice, near Paris, April 26, 1799. Under the Directory his father had been Minister of Foreign Affairs and had held other offices of honor. He mismanaged the family property, and the son had to struggle hard for an existence. He entered the studio of Guérin, when he was eighteen years old, and there became the friend of Géricault. Delacroix might have received academic honors if he had not, with Géricault and others, diverged from the classicism of the school of David and joined the Romantic School, of which he became the recognized leader. He first exhibited in 1822 "Charon's Bark Crossing the Acheron." This work made a great impression, was purchased for the Luxembourg Gallery, and is now in the Louvre. His "Massacre of Chios," exhibited in 1824, and now in the Louvre, caused an even greater sensation. Indeed, it may be termed a manifesto of the new Romantic School. The types were individual and characteristic instead of general and typical, as in the Classic School. The old ideas of composition were altogether disregarded, and the scene portrayed was one of gloomy horror and pathos. The painter was accused of worshiping the hideous instead of the beautiful, and his picture was dubbed "The Massacre of Painting." Its sale, however, enabled him to visit England in 1825, and further to increase his knowledge of the English colorists, by whom he had already been influenced. During this visit he acquired his life-long fondness for English literature, especially for Byron, Scott, and Shakespeare, whom along with Goethe he preferred to the more classic authors of his own country. In 1832 he was sent as a member of an embassy to Morocco, and he also visited Spain and Algiers. These travels enriched his palette with bright colors, and his Oriental subjects brought him great popularity. Nevertheless, he was unfortunate in selling pictures,



EUGENE DELACROIX
"THE BARK OF DON JUAN," FROM THE PAINTING IN THE LOUVRE, PARIS

and would have been in uncomfortable circumstances had he not received frequent commissions from the Government, after the Revolution of 1830. He was selected to execute mural paintings in a number of public buildings, and distinguished himself as much in this task as he had previously done in his canvases. A member of the Academy in 1857, he exhibited his last picture in 1859, and died in Paris on August 13, 1863. His life was solitary, and nearly all spent in his studio. He suffered much from ill health, which only urged him to greater exertions. He was of a refined and sensitive disposition, and was deeply wounded by the bitter controversies which his pictures provoked.

Delacroix was one of the greatest painters of the nineteenth century, and one of the greatest colorists of all times. His work has often been compared with that of Rubens, who exercised great influence upon him. His coloring is bright, but simple, the primary colors being chiefly used, and he is fond of obtaining color effects by placing complementary colors together. He has been criticised as being deficient in drawing, perhaps justly; although his surviving drawings reveal an excellent draughtsman, and when he sacrificed the distinctness of outline to color, he did it knowingly, as the greatest colorists have done before him. His art is impetuous and intensely dramatic, and he delights in passion and in motion. His activity extended over an immense variety of subjects; he painted everything—saints, warriors, lovers, animals, flowers, the ocean—and all equally well. He ransacked history and literature for subjects, but always rendered them as a painter in his own great language of color.

In his long career he produced something like two thousand paintings. Among his chief historical works, besides those mentioned above, are: "Hellas Mourning Over the Ruins of Missolonghi;" "Milton and His Daughters;" the "Death of the Bishop of Liège," after Scott's *Quentin Durward;* and the "Entry of the Crusaders Into Constantinople." Among his Oriental subjects are: "Algerian Women" (Louvre); the "Convulsionaries of Tangier;" and the "Jewish Wedding in Morocco." He also represented classical subjects, but in a personal and modern way. Prominent examples are the "Justice of Trajan" (Louvre), and the "Medea." His biblical subjects are also conceived in a thoroughly modern way as expressions of dramatic and passionate movement, and his decorative paintings are the boldest and most original of his day. In 1835 he decorated the interior of the Chamber of Deputies in the Palais Bourbon. On the ceiling of the Gallery of Apollo in the Louvre, he painted a magnificent "Triumph of Apollo," but the god is a Titan rather than an Olympian. He decorated the library of the Luxembourg with subjects from the *Divina Commedia,* and in the last years of his life he was engaged in painting in the Church of Saint Sulpice in Paris. Besides his many paintings he found time to illustrate Scott's novels, Goethe's *Faust,* and Shakespeare's *Hamlet,* and to write able articles on artistic subjects.

Consult: Muther, *History of Modern Painting* (London, 1896); Stranahan, *History of French Painting* (New York, 1899); Moreau, *Eugène Delacroix et son œuvre* (Paris, 1893); Robaut and Chesneau, *L'œuvre complet d'Eugène Delacroix* (Paris, 1885); Dargenty, *Eugène Delacroix par luimême* (Paris, 1885). His letters were published by Burty (Paris, 1880), and his journal by Flat (Paris, 1893).

DEL'AFIELD, Francis (1841—). An American physician, born in New York City. He graduated at Yale (1861) and the College of Physicians and Surgeons, New York (1863), and after further study abroad practiced medicine in New York. He was appointed to the staff of Bellevue Hospital, and to the chair of pathology and the practice of medicine in the College of Physicians and Surgeons. He published *Handbook of Post-Mortem Examinations and Morbid Anatomy; Lectures on Practical Medicine and Pathology* (1903), and, with Prudden, a *Handbook of Pathological Anatomy and Histology* (1904).

DELAFIELD, Richard (1798-1873). An eminent American military engineer. He was born in New York City; graduated at West Point, at the head of his class, in 1818; was assigned to the engineer corps, and served successively as assistant engineer for the construction of the defenses of Hampton Roads, as engineer in charge of the improvement of the Ohio and Mississippi rivers, and as superintending engineer of the division of the Cumberland Road (q.v.) east of the Ohio. From 1838 to 1845, and again from 1856 to 1861, he was superintendent of the United States Military Academy at West Point. He was superintending engineer of the defenses of New York Harbor from 1846 to 1855 (building Fort Wadsworth on Staten Island), and of the improvement of the Hudson River from 1852 to 1855, and acted also as chief engineer of the Department of Texas in 1853 and 1854. In 1855-56 he was president of the commission of three sent by the United States Government to observe the military operations of the Crimean War, and prepared the commission's elaborate report, which was published by the Government under the title *Report on the Art of War in Europe, in 1854, 1855, and 1856* (1860). During the Civil War he acted from 1861 to 1863 on the staff of Governor Morgan of New York, organizing and equipping the forces from that State; was superintending engineer of the defenses about New York City from 1861 to 1864, became a colonel in 1863, and a brigadier-general in 1864; and from April, 1864, to August, 1866, when he retired from the service, was chief of engineers of the United States Army, with headquarters at Washington. In March, 1865, he was brevetted major-general for "faithful, meritorious, and distinguished services in the engineer department during the Rebellion." After his retirement he served as a member of the commission for the improvement of Boston Harbor.

DEL'AGO'A BAY (Port., bay of water). An inlet of the Indian Ocean, on the southeast coast of Africa, in latitude 26° S., in the Portuguese Colony of Lourenço Marques (Map: Orange River Colony, J 4). It has a length of about 70 miles and a breadth of from 15 to 35 miles. Its lower portion is protected by the Inyack Peninsula and island, and forms there a safe and ample anchorage. Delagoa Bay receives the waters of several rivers—the Maputu, the Umbelosi, the Crocodile, the Umfusi. The coasts are low and covered with mangrove forests. The commercial importance of Delagoa Bay is very considerable, owing to the fact that it contains the port of Lourenço Marques, which is connected by rail with Pretoria (since 1895), thus affording an outlet for the output of the goldfields of the Transvaal. The railway from Lourenço Marques to Pretoria was constructed by a company of American and English capitalists and seized by the Portuguese Government after the death of the concessioner. After ten years of litigation the case was decided, in 1900, in favor of the United States and Great Britain, although the Portuguese Government was made to pay an indemnity of only about $3,000,000. During the South African War the port of Lourenço Marques was used for smuggling supplies to the scene of action. The British Government, in order to prevent further violation of neutrality, blockaded the port and seized several vessels, proceedings which led to some international complication. Consult Tesset, *The Key to South Africa, Delagoa Bay* (London, 1899).

DE LA HIRE, de lȧ ĕr, PHILIPPE (1640-1718). A remarkable French writer on the theory of curves. He was born in Paris, and was professor of mathematics in the Collège Royal and at the Académie d'Architecture. The following are his most important works: *Nouvelle méthode de géométrie* (1673); *Sectiones Conicæ* (1685); a treatise on epicycloids and roulettes (1694-1706). He was a pupil of Desargues, and founded his researches in conic sections and roulettes on the works of his master.

DELAMBRE, de-läɴ'br', JEAN BAPTISTE JOSEPH (1749-1822). A French astronomer, born at Amiens. He studied first under Delisle, and afterwards under Lalande, with both of whom he formed a close friendship. When, in 1781, the planet Uranus was discovered by William Herschel, Delambre worked out tables of its motion, that obtained for him the annual prize of the Academy and attracted to him the attention of the learned world in general. Soon after, he commenced the construction of new solar tables, and at a still later period, tables of the motions of Jupiter and Saturn. Along with Méchain, he was appointed by the French Government, in 1792, to measure the arc of the meridian between Dunkirk and Barcelona, which was completed in 1799. Afterwards he was elected a member of the Academy. In 1802 he was appointed inspector-general of education, and in 1803 perpetual secretary of the mathematical section of the Institute. The result of his measurements appeared in his great work, *Base du système métrique décimal* (3 vols., 1806-10). In 1807 he obtained the chair of astronomy at the Collège de France, rendered vacant by the death of Lalande, his master and friend. In 1814 he was appointed a member of the Council of Public Instruction. Delambre received a multitude of honors during his lifetime. He was a member of most of the learned bodies in Europe and an officer of the Legion of Honor. His writings are very numerous. The principal are: *Traité d'astronomie* (3 vols., 1814); *Histoire de l'astronomie au moyen âge* (1819); *Histoire de l'astronomie moderne* (2 vols., 1821); and *Histoire de l'astronomie au dix-huitième siècle* (1823-27), published under the care of Matthieu. Besides these, Delambre is the author of several excellent *Mémoires.*

DE LAN'CEY', EDWARD FLOYD (1821-1905). An American lawyer and author, born at Mamaroneck, N. Y., and educated at Hobart University and at the Harvard Law School. He was associated with various historical societies and was president of the New York Genealogical and Biographical Society from 1873 to 1877. Among his important and interesting contributions to the history of New York State are the following: *The Capture of Fort Washington the Result of Treason* (1877); *History of Mamaroneck, New York* (1886); and *The Origin and History of Manors in the Province of New York* (1886).

DELANCEY, JAMES (1703-60). An American jurist. He was born in New York, the son of a French Huguenot, graduated at Cambridge, England, and was admitted to the bar there. He returned to New York in 1725 and became prominent in the affairs of the city and colony. From 1733 until his death he was Chief Justice of the Supreme Court of New York, and in 1747-55 and 1757-60 was Lieutenant-Governor of the colony. He was one of the founders of King's College, now Columbia University, and presided over the Albany Convention of 1754 (q.v.).

DE LANCEY, OLIVER (1708-85). A British soldier, born in New York City. He was the youngest son of Etienne, and the brother of James De Lancey, the Lieutenant-Governor of New York (1747-55, 1757-60). He fought in the French War, was colonel-in-chief under General Abercrombie, and was present at the attack on Fort Ticonderoga. From 1760 to 1766 he was a member of the Provincial Council of New York. During the Revolution he occupied responsible positions on the Loyalist side, raising three regiments at his own expense, which he commanded as brigadier-general. In this capacity he occupied Long Island until the end of the war. His estates then being confiscated along with those of the other prominent Loyalists, he went to England and there died.

DE LANCEY, OLIVER (1752-1822). An American soldier. The son of Oliver De Lancey (1708-85), he was born in Edinburgh, Scotland. He served in the Seventeenth Light Dragoons, British Army (of which he eventually became colonel), and was sent to America to prepare accommodations for the regiment. He was present at Bunker Hill, and with his regiment participated in the victory of the British at the battle of Long Island. At the time of the capture of General Woodhull and his forces at Jamaica, L. I., it was De Lancey who rescued the wounded general. It was asserted that De Lancey struck Woodhull after he had surrendered, but this charge was not sustained. He occupied important positions in the Loyalist army, and was ultimately made adjutant-general as successor to Major André (1780). At the close of the war De Lancey returned to England and entered Parliament. He served in the Seventeenth Dragoons for forty-nine years, and was appointed a general in 1812.

DE LANCEY, WILLIAM HEATHCOTE (1797-1865). An American clergyman. He was born in New York, graduated at Yale in 1817, and studied theology under Bishop Hobart. He was afterwards assistant to Bishop White, of Philadelphia, and secretary to the House of Bishops in the General Convention of the Episcopal Church in the United States. In 1828 he became provost of the University of Pennsylvania, and in 1833 assistant minister in Saint Peter's Church, in Philadelphia. He was chosen Bishop of the diocese of Western New York in 1838, and in 1852 was a delegate from the Episcopal bishops of the United States to England.

DE LAND. A town and the county-seat of Volusia County, Fla., 60 miles south of Saint Augustine, on a short branch line connecting with the Atlantic Coast Line Railroad (Map: Florida, G 2). It is a health and winter resort known for its sulphur springs, and its fine shell-paved and shaded streets; and is the seat of the John B. Stetson University (Baptist), opened in 1887. Population, in 1890, 1113; in 1900, 1449; in 1905, 1496.

DELAND′, MARGARETTA WADE (CAMPBELL) (1857—). An American novelist, born at Allegheny, Pa. She was educated at New Rochelle, N. Y. She married L. F. Deland, of Boston, in 1880. In 1886 *The Old Garden and Other Verses* appeared. Her first novel, *John Ward, Preacher*, was published in 1888. She wrote also *Sidney*, a novel (1889); *Story of a Child* (1892); *Mr. Tommy Dove and Other Stories* (1893); *Philip and His Wife* (1895); *The Wisdom of Fools* (a volume of stories); *Dr. Lavendar's People* (1903); *The Common Way* (1904); *The Awakening of Helena Richie* (1906).

DELANE, dē-lān′, JOHN THADDEUS (1817-79). An English journalist, editor of the London *Times*. He was born in London, October 11, 1817; was educated at Oxford, and called to the bar at the Middle Temple. At the age of twenty-three he became editor of the *Times*, of which his father was financial manager. Under his editorship, the newspaper exerted an influence unparalleled in the history of journalism. He exposed the railway mania (1845), took an active part in the repeal of the corn laws, and led public opinion during the Crimean War. He retired in 1877, and died November 22, 1879.

DE′LANO, COLUMBUS (1809-96). An American lawyer, born in Shoreham, Vt. He was taken as a child to Ohio, where he was educated at the common schools, and was admitted to the bar in 1831, and attained eminence as a criminal lawyer. He was commissary-general of Ohio in 1861, served three terms in Congress, and in 1869 was appointed Commissioner of Internal Revenue, in which capacity he increased the receipts more than 100 per cent. in eight months. In October, 1870, he resigned, and from then until 1875 was Secretary of the Interior. He endowed the preparatory school at Gambier, Ohio, which bears his name.

DELA′NY, MARY (GRANVILLE) (1700-88). An English author, born at Coulston, Wiltshire. She was a friend of the Duchess of Portland, Miss Burney, George III., and Dean Swift. In her own day she became noted for her "flower work"—an arrangement of bits of colored paper in a kind of mosaic. Her *Autobiography and Correspondence* (ed. by Lady Hanover, 1st series, 3 vols., 1861; 2d series, 3 vols., 1862), contains many anecdotes of Pope, Swift, and other literary folk of the time. Consult: the *Diary* of Madame D'Arblay (London, 1842-46); Symonds, *Mrs. Delany* (Mary Granville); *A Memoir* (New York, 1900); Paston, *Mrs. Delany* (ib., 1900).

DELAPLANCHE, de-lȧ′pläNsh′, EUGÈNE (1836-91). A French sculptor, born in Paris. He was a pupil of Duret and gained the prix de Rome in 1864, and the medal of honor in 1878. His "Aurora" and the "Virgin of the Lilies" are in the Luxembourg. Other works by him are "Music" (1878), a statue in silver bronze called his masterpiece; "Eve After the Fall," and "Maternal Instruction." He is also noted for his decorations in relief on vases of Haviland faïence. His work is naturalistic, but at the same time dignified and graceful.

DE LARA, dȧ lä′rȧ, ISIDORE. An English composer, whose real name is Cohen, born in Dublin. He studied theory of music in Milan with Mazzucato, and became quite popular in England with his clever drawing-room lyrics. He also enjoyed a certain vogue as a singer, especially of his own compositions. Thanks to the special interest of the former Princess of Monaco, his opera, *Moïna*, was given a sumptuous production at the Monte Carlo Opera House in 1891, but was not heard elsewhere. In July, 1893, *Amy Robsart*, libretto drawn by Augustus Harris from Walter Scott, was given at Covent Garden, London. The music was unimportant. *Messaline*, book by Armand Silvestre and Eugène Morand, was produced at Monte Carlo, February 21, 1899, with Tamagno, Bouvet, and Mme. Héglon in the principal parts, and with a magnificent mounting. Since then it has been heard in London, 1899, and in 1900, with Calvé as Messaline, and also in 1902 in New York, with Calvé and Alvarez. Most of the New York musical critics condemned the opera on the ground of the libretto's immorality. The music was also criticised as being reminiscent, the few beautiful passages not atoning for the general lack of dramatic strength.

DE LA RAMÉE, de lȧ rȧ′mȧ′, LOUISE. See OUIDA.

DE LA REY, de lȧ rā′ē, JACOB HENDRICK (1849—). A famous Boer military leader of French Huguenot descent. He was born in the Lichtenburg District of the Western Transvaal, whither his father had moved after Sir Harry Smith and the British troops had driven them from the Orange Free State, in consequence of their participation with Pretorius in the driving out of the British from Bloemfontein in 1848. His early life was marked by a severe training in the art of warfare, through numerous campaigns against hostile Kaffir tribes. His first experience as a commanding officer was against the Basutos in the early 60's, during which he distinguished himself so conspicuously that when the Boer-British War of 1899-1902 broke out, he was unanimously elected to the command of the Lichtenburg burghers, who afterwards formed part of Cronje's western column. Like Cronje, he rarely carried weapons on the field, but was never seen without his field-glass, pipe, and Bible. Previous to the war he had represented his district for ten years in the Volksraad, and was a consistent supporter of Joubert, as against Kruger. He was not among the Boers who were anxious to begin war, and was one of the few prominent members of the Transvaal Volksraad who protested against the ultimatum of President Kruger. Hostilities once begun, however, he rapidly became one of the most determined leaders of his people, and in the first stages of the war greatly distinguished himself by the skill with which he laid out the lines of the battle of Magersfontein, and other smaller encounters. Later, he conducted a well-ordered retreat before the British advance under Lord Roberts, and at Nooitgedacht, in 1900, captured 500 British troops. In the second or guerrilla stage of the war he was equally distinguished by his successful tactics, his most important success being the capture of the British general, Lord Methuen, on March 7, 1902, together with a number of British troops. His lack of hospital accommodations, and the necessity he was under of making forced and sudden marches, precluded his detention of the wounded Lord Methuen, whom he accordingly had to release. His entire career throughout the war was marked by great personal gallantry and by the humane treatment accorded to his enemies. With the Boers he was one of the most popular leaders of the two republics, and he gained from his foes the reputation of being a leader of unerring military judgment and remarkable resourcefulness. In 1902 he took part in the peace negotiations with Great Britain, and was one of the deputation appointed to visit Europe and the United States for the purpose of raising funds for the distressed Boers. As a member of the head committee of the Boer organization *Het Volk*, founded in 1905, he continued to act as one of the most prominent advocates of the interests of his people.

DE LA RIVE, de lȧ rēv′, Auguste Arthur (1801-73). A Swiss physicist who devoted much attention to researches in electricity. He was born in Geneva, and at the age of twenty-two was appointed to the chair of natural philosophy in the Geneva Academy. He was one of the first to investigate the temperature of the earth's crust, and made observations in an artesian well 700 feet in depth. He discovered the process of electro-gilding, and in 1842 received for it a prize of 3000 francs from the French Academy of Sciences, of which in 1864 he was made a foreign associate. He made original discoveries in connection with magnetism, electro-dynamics, the connection of magnetism with electricity, the properties of the voltaic arc, and the passage of electricity through extremely rarefied media. He published a complete treatise on electricity (1853-58), which was for many years considered a standard work.

DELAROCHE, de-lȧ′rôsh′, Paul (1797-1856). A French historical painter, born in Paris, July 17, 1797. He was a pupil of Baron Gros, and one of the most representative painters of his time. In his "Joan of Arc" and the "Death of Queen Elizabeth" he essayed to follow the Romantic School, but early turned to historical painting. His "Death of the Duke of Guise" and "Cromwell Opening the Coffin of Charles I." are executed with technical power and fine dramatic effect. His "Children of Edward IV. in the Tower" appeared in 1831. Among other historical subjects are the "Execution of Lady Jane Grey" and "Lord Strafford on the Way to Execution Insulted by the Parliamentary Soldiers." His most ambitious work, finished in 1841, is the hemicycle in the Theatre of the Ecole des Beaux-Arts in Paris. In it the arts of different nations are depicted, and the seventy-five life-size figures that occupy the canvas are portraits of the artists of the times and countries represented. The figure that represents Gothic architecture is said to be a portrait of the painter's wife, who was a daughter of Horace Vernet. After her death, which occurred in 1845, a note of tenderness and pathos seems to have been added to his work, and under the inspiration of grief, as it were, he produced several sacred works. His "Christian Martyr" is widely known, and the "Crown of Thorns" and the "Return from Golgotha" show a spontaneity and freedom of treatment not always apparent in the works of Delaroche, and express a new impulse born of love and sorrow. His "Calvary" appeared in 1853, and "Jesus in the Garden of Gethsemane" in 1854. Among his later historical works are: "Napoleon at Fontainebleau," painted in 1847; "Bonaparte at Saint Bernard" (1850); and "Marie Antoinette Before the Revolutionary Tribunal" (1851). Delaroche painted without impetuosity, and consequently with little feeling. He had the pictorial sense in a high degree, and sometimes bordered on the melodramatic. His large and sumptuous picture of the "Death of Queen Elizabeth" is an instance of this. He painted rich stuffs with great skill, but never touched high sentiment or deep feeling. S. W. Reynolds, Desclaux, and others have engraved his principal works. Delaroche was a member of the Institute, and a professor in the Ecole des Beaux-Arts; he was an officer of the Legion of Honor and received many medals. He died in Paris, November 4, 1856. Consult: Stranahan, *A History of French Painting* (New York, 1899); Tytler, *Modern Painters and Their Painting* (Boston, 1899); Blanc, *Histoire des peintres français au XIX. siècle* (Paris, 1845); Rees, *Delaroche* (London, 1880).

DE LA RUE, Warren (1815-89). An English scientist. He introduced important improvements in oil-refining, color-printing, and envelope-folding machines, but is known chiefly for his photographs of the heavenly bodies. He published also a number of interesting papers on astronomy and physics.

DE LA TOUR, de lȧ to͞or, Maurice Quentin. See La Tour, Maurice Quentin de.

DELATTRE, de-lȧ′tr', Alfred Louis (1850—). A French archæologist, born at Déville-les-Rouen. Sent as a missionary to Algeria, he became chaplain of the Church of Saint Louis of Carthage and conservator of the archæological museum at Algiers. His investigations among the ruins of ancient Carthage have been valuable. His works include: *Carthage et la Tunisie au point de vue archéologique* (1883); *Inscriptions de Carthage* (1884-85); *Souvenirs de la croisade de Saint Louis trouvés à Carthage* (1888); *Les tombeaux puniques de Carthage* (1890); *Souvenirs de l'ancienne église d'Afrique* (1893); and *Musée Lavigerie de Saint-Louis de Carthage*, 3 vols. (1899-1900).

DELATTRE, Roland. See Lasso, Orlando di.

DELAUNAY, de-lō′nȧ′, Charles Eugène (1816-72). A French astronomer and mathematician. He was professor of mechanics in Paris and a member of the Academy, and succeeded Leverrier as director of the observatory. He published a number of valuable works, among which may be mentioned his *Traité de mécanique rationelle* and his *Théorie de la lune*.

DELAUNAY, Louis Arsène (1826-1903). A French actor, born in Paris. He made his first appearance at the Odéon in 1846, and for two years was engaged there as leading juvenile. In 1848 he appeared as Dorante in *Le Menteur*, at the Théâtre Français, and in 1850 became a regular member of that theatre. In 1877 he was appointed professor of dramatic declamation at the Conservatoire. He received the decoration of the Legion of Honor in 1883, and retired from the stage in 1887. He was one of the most accomplished of the French actors, finding his parts in the plays of Augier, De Musset, Victor Hugo, and Pailleron.

DELAUNAY, Jules Elie (1828-91). A French figure and portrait painter, born in Nantes. He was the pupil of Lamothe and Flandrin, and gained the prix de Rome in 1856. His notable decorative paintings are to be found in the foyer of the Opera House, the Hotel de Ville, the Church of the Trinity, and the Panthéon, in Paris. The paintings in the Panthéon, representing scenes from the life of Saint Genevieve, he did not live to complete. Among his best works are: "The Plague at Rome" (1869), a water-color called his masterpiece; "Diana," a fine nude; and "The Death of the Centaur Nessus"—all in the Luxembourg. He also painted portraits, among which that of his "Mother" and that of "Mademoiselle Toulmouche" are among his best canvases. His work is characterized by great attention to form, firm modeling, and a noble, rather severe style of composition. He was awarded a first-class medal at the Paris Exposition of 1878, and the medal of honor in 1889. In 1878 he became an officer of the Legion of Honor, and the following year was made a member of the Institute.

DE LAUNE, de lōn, Etienne. See Laune, or Laulne, Etienne de.

DEL'AVAN. A city in Walworth County, Wis., 62 miles southwest of Milwaukee; on the Chicago, Milwaukee and Saint Paul Railroad (Map: Wisconsin, E 6). It is the seat of the State School for the Deaf. The city is noted for its mineral springs, and, with Delavan Lake in the vicinity, is a popular place of resort. Population, 1900, 2244; 1905, 2321.

DELAVIGNE, de-lȧ'vē'ny', Jean François Casimir (1793-1843). A French lyric poet and dramatist, born in Havre, April 4, 1793. In 1815 he won a prize of the French Academy with an essay on a scientific topic. His first important writings were dithyrambic poems, *Les messéniennes* (1818), antique in form, but present and direct in their allusions to the disasters of the last Napoleonic years. These gave stirring expression to popular emotions, especially to the rancor and fears of the Liberals at the reactionary rule of the restored Bourbons. They achieved sensational success. In 1819 he turned the same talent to celebrate Joan of Arc, thus appealing to a universal patriotic sentiment before either Hugo or Lamartine had begun to touch the French heart with their Napoleonic verses. The forerunner should not be forgotten in the greatness of his successors, and in drama Delavigne is as important as either to the continuity of historic development. He stands between Beaumarchais and Emile Augier, almost the sole talented representative of dignified comedy, and while his dramatic work, taken chronologically, represents almost every phase of the conversion of a strict Classicist into a moderate Romanticist, his merits of prudent eclecticism are in danger of being obscured by the glories of his successors. His *L'école des vieillards* (1823) still holds the boards by its lively dialogue, graceful style, and ingenious invention. *Marino Falieri* (1829) anticipates the Hugoesque mingling of tragic and comic elements, preserving an academic correctness of form without following the classic rules. Other plays still occasionally acted and often read are: *Les vêpres siciliennes* (1819); *Louis XI.* (1832); *Les enfants d'Edouard* (1833); and *La fille du Cid* (1839). Delavigne was elected to the Academy in 1825, and in 1830 rose to the political occasion, as he had done after Waterloo. His song, "La Parisienne," set to music by Auber, rivaled for a time the "Marseillaise" itself, and "La Varsovienne" was sung as a battle march by the rebelling Poles. Indeed, it is as a poet of politics, a man of the hour, that Delavigne is at his best. At times very popular, he needed striking occasions to evoke his genius. When he became contemplative he was commonplace, but in direct appeal he wrote with terse vigor. His private life was above reproach. He died in Lyons, December 11, 1843. There are several editions of his *Works* (Paris, 1845, 1855, 1863), and a convenient one of the *Poems* and *Plays* (ib., 1863).

DEL'AWARE. One of the thirteen original States of the United States, constituting one of the Middle Atlantic States (Map: United States, L 3). It lies between latitudes 38° 30′ and 39° 45′ N. and longitudes 75° and 75° 50′ W. It is bounded on the north by Pennsylvania; on the east by the estuary of the Delaware River and by Delaware Bay, which separate it from New Jersey, and by the Atlantic Ocean; on the south and west by Maryland. It is next to the smallest of the States, and has a total area of 2370 square miles, of which 1965 square miles is land and 405 square miles is water surface. It has a length of about 96 miles from north to south, with a greatest width of 35 miles and a least width of 9 miles. At the entrance to Delaware Bay is Cape Henlopen, opposite Cape May, N. J.

Topography. The topography of Delaware is extremely simple, and presents little diversity of features. Almost the entire State is on the nearly level coastal plain, and probably averages less than 50 feet above sea-level. In the extreme north the surface is rolling, but the highest altitude, that of Southwood, is only 327 feet above the sea-level, while the only relief to monotonous level in the central and southern portions is the central sandy ridge, not exceeding 70 feet. The streams of Delaware, while numerous, are all small. In the northern part of the State the streams flow in an easterly or southeasterly direction across it from Pennsylvania and Maryland, and empty into the Delaware. Nearly all the State, however, lies on the peninsula between Delaware and Chesapeake bays, and the divide between their waters traverses the State from north to south, keeping at a uniform distance from the east coast. Thus, as the State broadens southward, a relatively greater part of it lies west of the divide in the south than in the north. None of these rivers is navigable, although the estuary-like mouth of Christiana Creek permits the ascent of vessels to Wilmington. The Delaware coast of Delaware Bay and the estuary of Delaware River offer few advantages in the way of harbors. Portions of the shore are marshy, and the only good harbors are at Lewes, Wilmington, and New Castle. The Delaware Breakwater has been constructed at great expense near the mouth of the bay, in order to remedy somewhat this deficiency of safe harbors. On the southern border of the State there is an area of swamp land covering 70 square miles.

On the Atlantic coast there are a number of shallow bays or lagoons separated from the ocean by sandy reefs; the shallowness of their entrances, however, limits there usefulness. The largest bays are Rehoboth and Indian River bays, which have a common outlet known as Indian River Inlet, which permits navigation by vessels drawing less than six feet of water.

CLIMATE AND SOIL. Situated on the eastern coast of the continent, Delaware has a temperate climate, with a considerable range of temperature and an ample rainfall.

The average annual temperature is about 55° F., varying from 56° at the extreme south to about 52° at the extreme north. The average daily range of temperature, or difference between the highest and lowest temperatures during twenty-four hours, is from 16° to 20°. The highest summer temperature on record is 103° and the lowest winter temperature — 17°; even in midsummer the temperature has descended to 50°. On the average August day the temperature rises to about 85°, and on the average January day the temperature descends to 25°. In the fall frosts seldom occur before October 10th, and may not occur until about November 1st; while in the spring they may occur as late as the latter part of April. The advent of spring (i.e. the awakening of plant life) occurs on the average about the end of March.

The annual rainfall is, on the average, from 40 to 45 inches over the State as a whole, but is slightly greater on the coast than inland. The rainfall is rather evenly distributed over the whole year, although there seems to be somewhat less precipitation in late fall and early winter than at other seasons of the year. Damaging droughts are not infrequent, but killing droughts are unknown. Heavy rainfalls take place; sometimes an average month's rainfall occurs in a single day; but damaging rain-storms are rare. Thunder-storms and hail-storms are most frequent from May to August. The prevailing winds are from the northwest from October to May, from the southwest in June and July, and variable during the intervening spring and fall months.

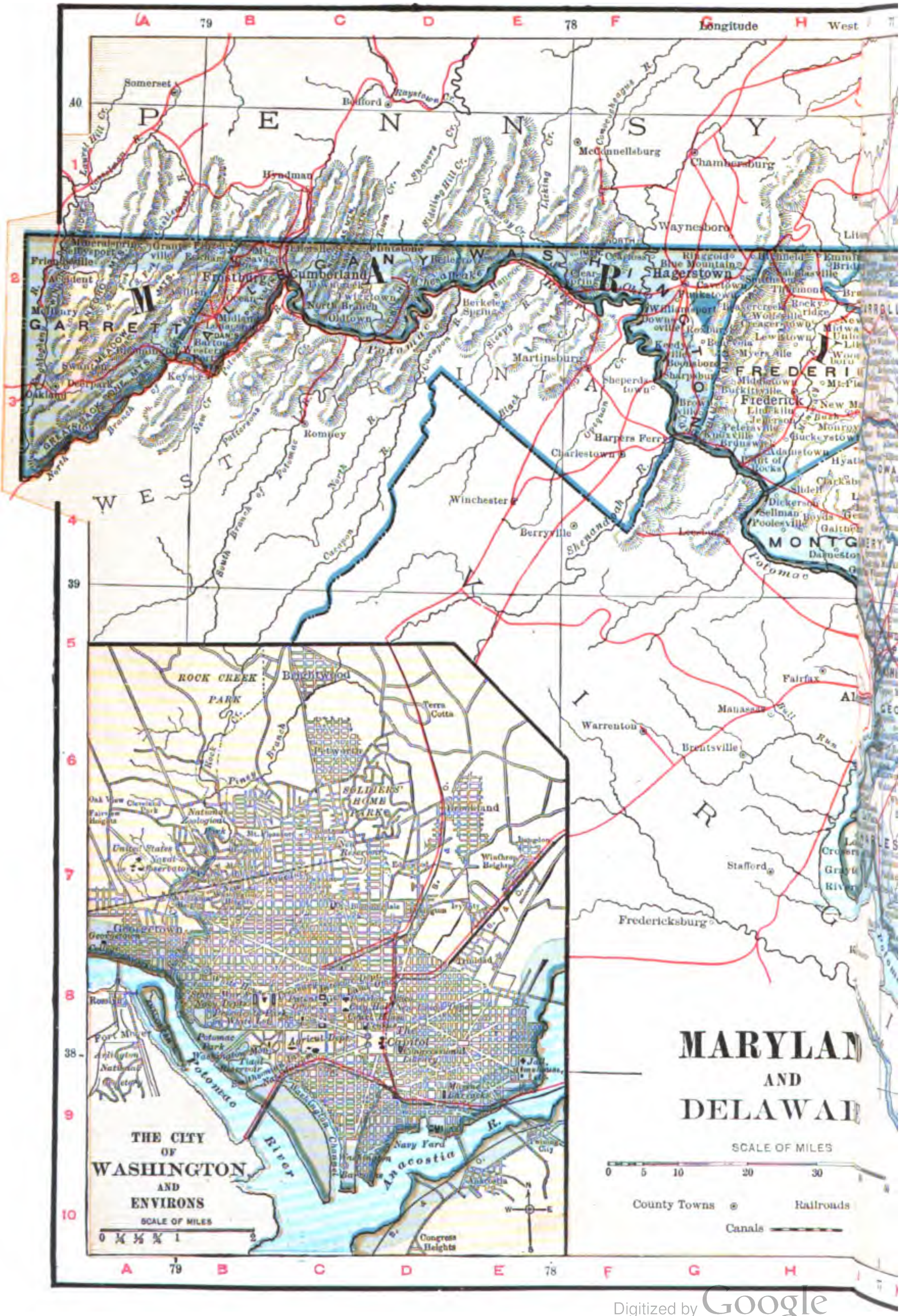
The soils are sedimentary, derived from the underlying Tertiary rocks. In the rolling northern portion of the State the soil is clay, passing through the various gradations from a heavy clay to a loamy clay, and is well adapted for raising fruits, grasses, and grains. In the undulating middle section, approximately covered by Kent County, the soil is generally loamy. Here fruits, berries, vegetables, and the vine flourish. In the flat southern section of Sussex County the soil is sandy, with here and there outcrops of loamy clay. This region is best adapted for strawberry and peach culture. For flora and fauna see the respective paragraphs under UNITED STATES.

GEOLOGY AND MINERALOGY. The entire State falls within the Atlantic coastal region, and is therefore underlain by strata of recent geological age (Map: Special Map). Cretaceous strata appear in the northern part of New Castle County, while southward Tertiary and Post-Tertiary beds predominate. Clays suitable for the manufacture of brick and terra-cotta, and kaolin, are found in the vicinity of Wilmington. A small area of granite occurs near this city, from which building-stone and road-material are quarried, and some feldspar has been extracted. Glass-sand, marls, and bog-iron ore are known to form extensive deposits. The output of granite in 1905 was valued at $178,428.

AGRICULTURE. Agriculture is the leading industry, farms constituting 85 per cent. of the total land surface. The figures in this connection have not changed materially in three decades. The fact that the soil is best in the northern part of the State is reflected in the values of land, which average $45 per acre in the northern section, $19 in the middle, and $12 in the southern. During the last half-century there has been a continuous and marked increase in the number of farms, and a corresponding decrease in the average size. In 1850 the average farm was of 158 acres; in 1900, 110 acres. Twenty-seven per cent. of the farms in 1900 were between 50 and 75 acres in extent, while 30 per cent. were between 100 and 175 acres. Compared with other States, a large per cent. of the farms are rented, and the per cent. has increased from 42 in 1880 to 50 in 1900. Share-renting is the prevailing method.

In no State have fertilizers become so generally used, the average amount per farm ($55.65) being three times that for the North Atlantic States. There was a marked increase during the sixteen years succeeding 1890 in the two principal crops—corn and wheat. The increased interest in the latter is most remarkable in view of the opposite tendency in most Eastern States. The wheat acreage is several times that for all the New England States. The other cereals are relatively unimportant. The oats crop in 1906 had decreased to about one-fifth the acreage of 1890. Hay ranks third in acreage. Orchard and small fruits have long constituted one of the main sources of income. In late years, however, the greater number of peach-trees—which greatly excelled all other trees in number and importance—have been destroyed or injured by frosts, and increased attention has been turned to market and farm gardening. Delaware is one of the leading States in the production of tomatoes. There are fruit-evaporating and canning industries at Dover, Milford, and other cities. The proximity of the large coast cities, particularly Philadelphia, is greatly in favor of garden farming. Stock-raising is of secondary importance, and has been about stationary for a number of years. The returns for 1906 show 36,000 dairy cows, 21,600 other cattle, 46,000 swine, and 36,000 horses.

MANUFACTURES. The manufacturing industry rivals agriculture in importance. The location is favorable, inasmuch as the coal and iron of the neighboring States can be put down at Wilmington as cheaply as at Philadelphia; while the position on the coast affords an advantage in shipping and in ship-building. The falls near the mouth of the Brandywine have been, from an early date, extensively utilized for manufacturing purposes.

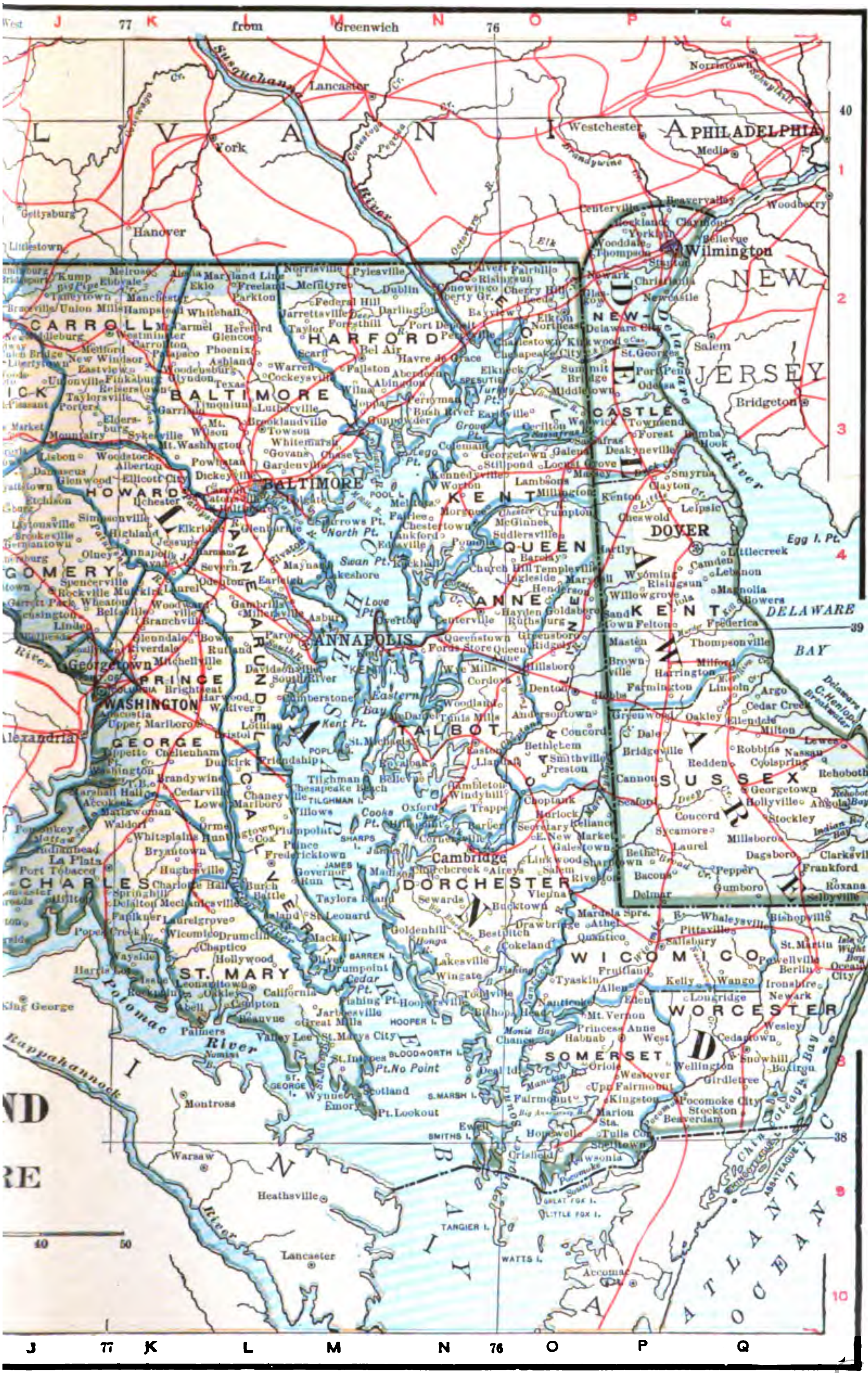


MARYLAN

AND

DELAWA

THE CITY OF WASHINGTON AND ENVIRONS



COPYRIGHT, 1904, BY DODD, MEAD & COMPANY.

The census of 1900 showed 1417 manufacturing establishments with 22,200 wage-earners and products valued at $45,000,000. Of these establishments, 633, employing 20,500 wage-earners are comparable with the class of establishments included in the special census of 1905, when the number of establishments showed a decrease of two, with 2000 fewer laborers but with products of equal value. The leather industry was the foremost in 1905 both in capital invested and in value of product. The 20 establishments showed an increase since 1900 of over $1,500,000 and a product valued at $10,250,000. The other leading industries in the order of the value of products were, car construction and repair, foundries and machine-shops, paper and wood-pulp, iron and steel, including ship-building, flour and grist mills, and canning fruits and vegetables. The textile industries have shown a marked decline since 1890.

FISHERIES. The fishing industry is of minor importance, and is much less extensive than in the neighboring coast States. The aggregate value of the product in 1904 (latest bulletin) was $259,590, the oyster, shad, squeteague, and white perch fisheries being the most important. The men employed numbered 1899.

TRANSPORTATION AND COMMERCE. A number of the trunk lines connecting the East with the South and the West pass through the northern part of the State. The total mileage in 1906 was 335, or a little more than 16 per 100 square miles of territory or than 17 per 10,000 inhabitants. Chesapeake and Delaware bays are connected by a canal 13½ miles long, 66 feet wide, and 10 feet deep. This work was completed in 1829, at a cost of $2,250,000. The massive breakwater at Lewes was begun in 1828, and completed in 1869, at a cost of over $2,000,000. There is some foreign commerce direct through Wilmington, but such trade is generally through Baltimore or some Northern port. The coasting trade is important, especially with New York, with which Wilmington is connected by a line of steamers. Wilmington is a customs district, and there are deputy collectors at New Castle and Lewes.

BANKS. On November 12, 1906, there were 24 national banks in operation in the State, with a combined capital of $2,274,000 and deposits of $8,726,000; on June 18, 1906, there were four State banks, with a capital of $520,000 and deposits of $1,850,000, and two mutual savings banks, with deposits of $8,326,000 and 30,119 depositors, an average of $276, the smallest of any of the Eastern States.

POPULATION. In 1790 Delaware had a population of 59,000; in 1820, 72,700; in 1850; 91,500; in 1860, 112,200; in 1870, 125,000; in 1880, 146,600; in 1890, 168,500; in 1900, 184,700, and in 1905 (est.), 192,855. But three States had less population at the last census, and but six a lower rate of increase for the decade. There were 94 individuals to the square mile. The negroes in 1900 numbered 30,700; and the foreign-born 13,800, of whom about one-half were Irish. Wilmington in 1900 had a population of 76,500, or 41 per cent. of the total population; its population in 1906 (est.) was 85,000. Dover is the capital.

RELIGION. The leading religious denominations are the Methodist Episcopal, Roman Catholic, Presbyterian, Protestant Episcopal, and Baptist. Wilmington is the see of the Protestant Episcopal diocese of Delaware and of the Roman Catholic diocese of Wilmington.

EDUCATION. The present public-school system dates from 1898. The State school fund is largely derived from Delaware's share in the United States surplus revenue and from the proceeds of certain fees and licenses. The State Constitution places a minimum limit of $100,000 on the annual appropriation for schools in addition to the school fund. In 1906 $132,000 was thus distributed to the counties for exclusive use in the payment of teachers' salaries and supplying free text-books. There are separate race schools. The school year averages 160 days in length. From a population estimated at 192,855 there were in 1905-6, 35,015, or 18 per cent., enrolled in school, the average attendance being about 17,500. There were 803 teachers, of whom 90 per cent. were females. There were 35 public high schools, with a total attendance of 1400. There is an agricultural college for colored students at Dover. The State has no normal schools, but teachers' institutes are held in each county. The only institution for higher instruction is Delaware College at Newark.

GOVERNMENT. The present Constitution was adopted in 1897. To be amended, it requires a two-thirds vote of all members of each House at two consecutive Legislatures. A constitutional convention may be called if demanded by a two-thirds vote of each House, approved by a vote of the people. The right of suffrage requires a residence in the State for one year, in the county three months, and in the election district for thirty days. The usual mental qualifications are required, as is also the ability to read the Constitution. Disfranchisement follows conviction for felony or implication in attempted bribery in connection with franchise. Registration is required.

Legislative.—Elections and legislative sessions are held biennially—the former on the Tuesday after the first Monday in November. There is a Senate of 17 members, 7 from the northern county and 5 from each of the other two, chosen for four years, and a House of Representatives of 35, the northern county having 15 members and the other two 10 each, chosen for two years. Senators must be twenty-seven years of age or over; Representatives must be twenty-four or over; and both must have been citizens of the State three years, and the last year a resident of the districts from which they are elected, to be eligible to seats in the Legislature. The $5 per diem salary is discontinued after the sixtieth day of the session. Revenue bills must originate with the House of Representatives. The power of impeachment rests with the House of Representatives, but trial with the Senate.

Executive.—The Governor is elected for a period of four years, and is not eligible a third time. The Governor may veto any bill or any portion of a bill appropriating money, but the veto may be overridden by a three-fifths vote of each House. The Governor grants pardons upon recommendation of the Board of Pardons. The Lieutenant-Governor presides over the Senate. The Attorney-General and Insurance-General also serve four years each.

Judiciary.—There are six State judges, one of whom is Chancellor and one Chief Justice, and all of whom are appointed by the Governor with the consent of the Senate for a term of 12 years.

Treason, murder in the first degree, arson of a dwelling, rape, and burglary at night, with intent to commit high crimes, are punishable with death. The whipping-post and pillory have been in use for petty offenders. Adultery by a wife or impotence on either side is a cause for divorce; and divorce may be granted for cruelty, abandonment, etc. Until 1828 the Presidential Electors of Delaware were chosen by the Legislature; since then they have been elected by the popular vote. In 1812, 1816, and 1820 Delaware had two Representatives in Congress, and therefore cast four electoral votes; but at all other times, having but one such Representative, it has cast only three electoral votes.

MILITIA. There was in 1906 an organized militia of one regiment consisting of 7 companies with a total of 369 men.

FINANCE. In January, 1905, the total assets of the State amounted to $1,458,561, of which $1,391,522 represented investments. The State debt in 1906 was $756,785, the greater part of which was incurred in the loans of 1887 and 1897. The disbursements for the year 1906 amounted to $416,634, and the receipts, $425,336. The largest items of the receipts were licenses and fees, franchise tax and railroad tax.

HISTORY. The aboriginal inhabitants of the region belonged to the Lenni Lenape family, but Iroquois hunting parties frequently traversed the country. The name Delaware was first applied to the bay which Lord de la Warr entered in 1611. Mey, a Dutch explorer, built Fort Nassau near the site of Philadelphia in 1623, and in 1631 a Dutch company, headed by De Vries, established a colony on Lewes Creek, near Cape Henlopen, which the Indians destroyed. In 1638 Swedes erected a fort on Christiana Creek, named the country New Sweden, and subsequently established a military post on the island of Tinnicum, below Philadelphia. The Dutch considered this an invasion of their territory and set up Fort Casimir, near the site of the present New Castle. A settlement on the Delaware, made in 1641 near the present site of Salem, N. J., by a colony from New Haven, existed for only two years. After 1642 the Swedes and the Dutch came into open conflict. The Swedes took Fort Casimir in 1654, but were driven out in the following year by the Dutch, who seized the whole country. When New Netherlands came into the possession of the English the settlements on the Delaware were claimed both by the Duke of York and by Lord Baltimore. In 1683 William Penn received the territory in fee from the Duke of York and effected a compromise with Lord Baltimore, and for twenty years Delaware was governed as a part of Pennsylvania under the name of the 'Territories or Three Lower Counties on the Delaware,' each county sending six Representatives to the General Assembly. In 1703 Delaware established a separate legislature, but continued to acknowledge the authority of the Governor of Pennsylvania till the Revolution. In the War of Independence, the 'Blue Hen's Chickens,' as the Delaware volunteers were called, rendered efficient service. The State was the first to ratify the Federal Constitution, December 7, 1787.

Though a slave-holding State, Delaware remained faithful to the Union in 1861, and contributed nearly 14,000 troops to the Northern armies. In the southern part of the State, however, the Confederate sentiment was strong, and large numbers went to join the Southern forces. The Fourteenth Amendment was denounced by the Legislature, and though no forcible attempts were made, as in the South, to hamper the negroes in the exercise of their newly acquired civil and political rights, the feeling of race hatred prevailed for a long time after the war.

The period since 1865 has witnessed a remarkable growth of the railway system, the development of the fruit industry, and the rise of Wilmington as a ship-building and manufacturing centre. Progress in public education has been, on the whole, unsatisfactory, owing to the lack of a central Department of Instruction. The rapid growth of Wilmington in population since 1873 has created great opposition to the prevailing system of representation in the Legislature as being unfair to the inhabitants of that city. This is owing to the fact that the State Representatives are apportioned arbitrarily among the three counties, with the result that New Castle County, containing the city of Wilmington, with an industrial population one and a half times that of the agricultural counties of Sussex and Kent, has always been in a hopeless minority. From 1788 to 1852 Delaware was a Federal or Whig State in national elections excepting in 1820, when it cast its vote for Monroe. Since 1852 it has been a Democratic State with the exception of the years 1872, 1896, 1900 and 1904. In State politics it was consistently Democratic from 1865 to 1900. In 1895 the Republican Party, owing to internal dissensions, was split into two factions. This led to a prolonged contest for the choice of a United States Senator. Neither faction yielded, and the Democratic party being too weak to profit by the dissension, Delaware had only one Senator from 1895 to 1901, and then had none until 1903, when two were elected. A deadlock again occurred in 1905, and was not broken until June 13, 1906, when Du Pont was chosen. The first State Constitution was adopted in 1776, the second in 1791, the third in 1831, the fourth in 1897. Consult Scharf, *History of Delaware*, 2 vols. (Philadelphia, 1888); Sellers, *Allied Families of Delaware* (Philadelphia, 1902).

DELAWARE. A river of the Eastern United States, which rises on the western slopes of the Catskill Mountains (q.v.) in southeastern New York (Map: New Jersey, C 1). It flows in a southwest course to Deposit, a distance of about 100 miles. Here it turns sharply to the southeast and soon forms the boundary between Pennsylvania and New York, receiving at Hancock the waters of the eastern branch, which also rises in the Catskills. At Port Jervis, N. Y., where it becomes the boundary between Pennsylvania and New Jersey, it turns to the southwest and flows in that course to Delaware Water Gap (q.v.), thence generally southward to Easton, Pa., thence southeast to a point just below Trenton, thence southwest again past Philadelphia and Chester, Pa., where it begins to broaden into an estuary, which gradually widens into Delaware Bay. In its lower course it separates New Jersey from Delaware. Its length is 410 miles and it drains an area of 12,012 square miles, of which one-fourth is in New York, over one-half in Pennsylvania, and about one-fifth in New Jersey. Its mean discharge at Lambertville has been estimated at 18,600 cubic feet per second. It has a considerable fall and furnishes extensive power at Trenton, where it crosses the Fall Line (10 to 15 feet fall), at Lambertville (Welles's Falls, 14 feet), at Belvidere (Foul Rift, 23 feet), and at Port Jervis (30 feet). Its chief tributaries are the Schuylkill (q.v.) and the Lehigh (q.v.), both from the west. It is navigable for large ships to Philadelphia and for steamboats to the head of tidewater at Trenton. It is seldom that navigation is closed by ice below Philadelphia. A canal parallels the left bank of the river from Easton, Pa., to Morrisville (opposite Trenton), and then cuts across a bend to Bristol. A canal also connects Trenton with New Brunswick (on the Raritan River), and another crosses New Jersey from near Phillipsburg to Jersey City on the Hudson River. A fourth canal parallels the Lehigh River and connects Mauch Chunk with Easton, while a fifth parallels the Lackawaxen River from Honesdale, Pa., to Lackawaxen on the Delaware, and parallels the Delaware to Port Jervis.

DELAWARE. A city and the county-seat of Delaware County, Ohio, 24 miles north of Columbus, on the Whetstone (Olentangy) River, and on the Cleveland, Cincinnati, Chicago and Saint Louis, the Pennsylvania Company, and the Hocking Valley railroads (Map: Ohio, E 5). It is the seat of the Ohio Wesleyan University (Methodist-Episcopal), opened in 1844, and has a public and other libraries. There are mineral springs noted for medicinal properties. The city carries on a considerable trade, and has foundries, railroad repair shops, clay-works, and manufactures of chairs, carriages, building material, gloves, flour, woolens, lumber, etc. Delaware, incorporated in 1827, is governed by a mayor, elected every two years, and a municipal council. Population, 1900, 7940; 1906 (local est.), 9385.

DELAWARE (from the Delaware River). One of the most important tribes of Algonquian stock, originally occupying what is now New Jersey and the Delaware River basin, eastern Pennsylvania, and southeastern New York. They call themselves *Lenape*, 'true men,' and claimed and were accorded precedence over nearly all the other tribes of Algonquian kinship. They had a number of subtribes in three principal divisions, of which the Munsee (q.v.) or Wolf tribe differed considerably from the others. They were friendly with the Dutch and Swedish colonists, and in 1682 made the celebrated treaty with William Penn, which was faithfully kept on both sides for over half a century. German Moravian missionaries, among whom were the devoted Zinzendorf, Zeisberger, and Heckewelder, labored among them with great success. Through the aggression of the later settlers, backed by the powerful Iroquois, they were finally compelled to retire to the Susquehanna and upper Ohio region, in consequence of which they became embittered against the English colonists and threw their whole strength with the French side in the French and Indian War of 1754-63. In the Revolution they joined with the British against the Americans, and, with other tribes of the Ohio Valley, continued the struggle until crushed by Wayne and compelled to accept the treaty of Greenville, by which, in 1795, the allied tribes ceded nearly all their ancient claims in what is now Pennsylvania and Ohio. During this struggle occurred the massacre of the peaceful Christian Delawares at Gnadenhuetten, Ohio, in consequence of which the remaining converts fled to Canada. By successive removals the larger portion of the tribe drifted from Indiana to Missouri and Kansas, a considerable band settling by Spanish permission in eastern Texas. The main body removed in 1867 from Kansas to the Indian Territory and became incorporated with the Cherokee Nation. The whole tribe, including the Munsee, numbers now about 1750, distributed as follows: Incorporated in Cherokee Nation, 780; on (late) Wichita reservation, Oklahoma, 95; Munsee, with Chippewa, in Kansas, 55(?); Munsee, with Stockbridge, at Green Bay, Wis., 210(?); 'Moravians of the Thames,' Ontario, 355; 'Munsees of the Thames,' Ontario, 120; Delaware, with Six Nations, on Grand River reserve, Ontario, 135.

DELAWARE BAY. A bay on the Atlantic Coast of the United States, between the States of Delaware and New Jersey (Map: New Jersey, B 5). It receives the Delaware River, whose estuary gradually emerges into the bay. It is about 40 miles long to where it contracts to a width of 4 miles. Its greatest width is 25 miles, and the width at the entrance, between Cape May, in New Jersey, and Cape Henlopen, in Delaware, is about 15 miles. The depth of the channel varies from 30 to 60 feet, but much of the bay has less than 30 feet of water. A breakwater at Cape Henlopen, constructed by the United States Government, forms a large and safe harbor from 24 to 35 feet deep. Government lighthouses are maintained at the entrance to the bay and also at a number of places within the bay, not only to mark points on the shore, but also shoal places in the channel. A large tonnage of coast and foreign shipping passes through the bay to and from Wilmington, Chester, and Philadelphia.

DELAWARE COLLEGE. An educational institution founded at Newark, Del., in 1833. In 1859 the college was closed and was not reopened until 1870, when it was made a beneficiary of the Congressional act of 1862 granting public lands to the several States for the purpose of establishing colleges of agriculture and mechanic arts. Under a further Congressional act, known as the 'Hatch Bill,' an agricultural experiment station was established at the college in 1887; and under an act of 1890 the college receives annually some $20,000 additional. The college confers degrees in arts, science, and the technical sciences. In 1906 the college property amounted to $275,000, and the total annual income to $45,000. At the same time the library contained 15,000 volumes.

DELAWARE WATER GAP. A low gap and narrow gorge in the Kittatinny Range of the Appalachian Mountains on the borders of Pennsylvania and New Jersey, near Stroudsburg, Pa. (Map: Pennsylvania, F 3). The Delaware River flows through the gap. The steep mountain sides rise to a height of 1400 feet above the water, forming very picturesque scenery, which makes the region a popular summer resort. It is reached by rail from Philadelphia (108 miles), and New York (88 miles).

DE LA WARR, or **DELAWARE,** THOMAS WEST, Lord (1577-1618). A Colonial Governor of Virginia. He succeeded his father as Baron De la Warr, and became a member of Queen Elizabeth's Privy Council in 1602. In 1609 he became a member of the Council of Virginia; and in February, 1610, was appointed first Governor and Captain-General of Virginia, arriving at Jamestown just in time to prevent the original colonists from abandoning the settlement. Though he lived with ridiculous pomp, he was an able and energetic officer, and infused new life into the previously mismanaged colony. He planted a small settlement on the site of the present Hampton, and built two forts, Henry and Charles, named in honor of King James's sons. In March, 1611, he sailed for the West Indies, but was driven by a storm into the river which now bears his name. He never returned to Jamestown, though he remained the nominal Governor, and contributed large sums of money to the enterprise. In 1618, in answer to the urgent request of the colonists, then smarting under Argall's oppression, he sailed again for America, but died on the voyage. His *The Relation of . . . Lord De La Warr . . . to the Council of Virginia*, originally published in 1611, was republished in 1858.

DELBŒUF, dĕl'bĕf, Joseph Remi Léopold (1831-96). A Belgian philosopher, born in Liège. In 1860 he became an instructor in the Normal School of his native town, in 1863-66 was professor of philosophy in Ghent, and, from 1866, in Liège. His works include: *De la moralité en littérature* (1861); *De la psychologie comme science naturelle, son présent et son avenir* (1875); and *Le sommeil et les rêves* (1885).

DELBRÜCK, dĕl'brṳk, Berthold (1842—). A German comparative philologist and Sanskrit scholar, born in Putbus. He studied at the universities of Halle and Berlin, and was appointed professor of comparative philology and Sanskrit in Jena in 1869. His works include: *Einleitung in das Sprachstudium* (4th ed., 1904; English trans., 1882); *Syntaktische Forschungen*, vols. i.-v. (1871-88); and *Vergleichende Syntax der indogermanischen Sprachen*, which forms volumes iii., iv., and v. of Brugmann and Delbrück's *Grundriss der indogermanischen Sprachen* (Strassburg, 1893-1900) and *Grundfragen der Sprachforschung* (1901).

DELBRÜCK, Hans (1848—). A German historian and politician. He was born in Bergen, on the island of Rügen, and was educated in Heidelberg, Greifswald, and Bonn. He served as officer in the Franco-German War. In 1874 he became preceptor of Prince Waldemar of Prussia, a brother of Emperor William II. After serving as Deputy in the Reichstag, in 1883 he became an editor of the *Preussische Jahrbücher*, assuming charge in 1889. In 1885 he became professor of history at the University of Berlin. His works include: *Die Perserkriege und die Burgunderkriege* (1887); *Die Strategie des Perikles erläutert durch die Strategie Friedrichs des Grossen* (1890); *Friedrich, Napoleon, Moltke. Aeltere und neuere Strategie* (1892); *Geschichte der Kriegskunst im Rahmen der politischen Geschichte* (1900); and *Geschichte, etc.* (2 vols. 1900-2).

DELBRÜCK, Martin Friedrich Rudolf von (1817-1903). A German statesman, born in Berlin. He came of a distinguished family, his father, Johann Friedrich Gottlieb Delbrück (died 1830), having been preceptor of the two Prussian princes afterwards respectively known as King William IV. and Emperor William I. He studied in Halle, Bonn, and Berlin. After an association of fifteen years with the Prussian Bureau of Commerce (organized as the Ministry of Commerce in 1848), he became in 1859 director of the Department of Commerce and Industry, in which capacity he skillfully consolidated the German Zollverein and negotiated important treaties with France (1862), and subsequently with England, Belgium, Italy, and other European States. In August, 1867, Bismarck secured his advancement to the presidency of the Chancery of the North-German Confederation. He also became a Prussian Minister of State in 1868, and in both positions, in which he was virtually the representative of the 'Iron Chancellor,' he displayed a strict adherence to constitutional principles, notwithstanding the great difficulties frequently encountered in the defense of the measures advocated by Bismarck. In October, 1870, he was sent on diplomatic missions to the various courts of South Germany, in order to promote the unification of the country, and the ultimate conclusion of the treaties at Versailles (November 15, 23, and 25, 1870) was directly due to the skill and tact with which Delbrück had discharged this important mission. He was president of the Imperial Chancellery until 1876, when Bismarck began to inaugurate that protective policy which Delbrück as the representative of free trade had ever strenuously opposed. His literary productions include the anonymous monograph *Der Zollverein und das Tabaksmonopol* (1857) and the legal treatise entitled *Der Artikel 46 der Reichsverfassung.*

DELBRÜCK, Max Emil Julius (1850—). A German chemist, born in Bergen. He studied chemistry in Berlin and in Greifswald. In 1872 he was made assistant at the Academy of Trades in Berlin; in 1887 he was appointed instructor at the Agricultural College, and in 1899 was given a full professorship. His researches resulted in technical contributions of the highest value to the fermentation industries. He was one of the editors of the *Zeitschrift für Spiritusindustrie* (1867), and of the *Wochenschrift für Brauerei.*

DELCASSÉ, dĕl'kȧ'sȧ', Théophile (1852—). A French statesman, born at Paniers. He became known as the author of able articles on foreign politics contributed to various journals, and in 1889 was elected to the Chamber of Deputies. He was made under-secretary for the colonies in 1893, and in 1894-5 was colonial minister in the Dupuy cabinet. In the Brisson cabinet of June, 1898, he received the portfolio of foreign affairs and retained office for eight years. During his long administration he brought about the alliance with Russia, established relations of amity with Italy, drew into closer touch with Spain, and entered into relations of intimate friendship with Great Britain. With the last power he negotiated a settlement of the difficulties connected with the French occupation of Fashoda (q.v). From that time relations between the two nations grew increasingly friendly until the Agreement of April 8, 1904, embodied a series of mutual concessions. The German government, regarded M. Delcassé's policy of alliances as aiming at Germany's isolation in Europe, and in 1905 made the question of Morocco (q.v.) an issue for bringing about the fall of the hostile minister. Confronted by the threat of war, the French premier M. Rouvier forced the resignation of M. Delcassé June 6,

1905. In May, 1906, he was reëlected to the Chamber of Deputies.

DEL CRED'ERE (It., upon faith or credit, from Lat. *credere*, to believe). A phrase of the law merchant, which has been adopted into the commercial codes of Europe as well as into the common-law system of England and America. A *del credere* agent is one who, in consideration of an additional compensation, undertakes to become personally responsible to his principal for the payments and other obligations which accrue to him as the result of his dealings. His undertaking is in the nature of a continuing guarantee that his principal shall suffer no loss through the default of those to whom he has extended credit on the principal's account. The class of agents known as factors are commonly employed on this basis. The agent is said to be acting under a *del credere* commission or authority. See FACTOR; PRINCIPAL AND AGENT.

DELEB PALM. See PALMYRA PALM.

DELÉCLUZE, d*e*-lå'klụz′, ETIENNE JEAN (1781-1862). A French art critic and painter, born in Paris. He studied in the atelier of David, and obtained a gold medal in 1808, but after 1816 devoted himself to literature. He contributed to the *Revue Française* and the *Revue des Deux Mondes*. He wrote: *Précis d'un traité de la peinture* (1828); *Louis David, son école et son temps* (1855); *Souvenirs de soixante années* (1862). Among his romances are *Mademoiselle Justine de Liron* (1832) and others, collected as *Romans, contes et nouvelles* (1843).

DELECTABLE MOUNTAINS, THE. The pastures of "the chosen," in *Pilgrim's Progress*.

DELE'DDA, GRAZIA (1873—). An Italian novelist, born at Nuoro, Sardinia. In 1900 she married and settled in Rome. Her books include: *Racconti sardi* (1893); *Anime oneste* (1895); *La via de male* (1896); *Le tentazioni* (1899); *Le giustizia* (1901); *Dopo il divorzio* (1902), translated into English in 1905; *Cenere* (1903); *Nostalgie* (1905).

DELEGATE, APOSTOLIC. See LEGATE.

DELEGATES, COURT OF. The old English court of appeal in ecclesiastical and maritime causes. Before the time of Henry VIII. the practice had become established of taking ecclesiastical causes on appeal to the court of Rome. By 24 Hen. VIII. c. 12, this practice was abolished, and appeals were directed to be heard by the archbishops of the several provinces. By 25 Hen. VIII. c. 19, it was directed that appeals should finally be referred to the King in council, and his Majesty was by the same statute empowered to issue a commission under the great seal to hear the appeals. The court thus established was called the court of delegates. It consisted, in ordinary causes, of a puisne judge from each of the common-law courts, and three or more doctors of the civil law. After sentence had been pronounced by the court of delegates, it was competent for the King to grant a commission of review; but this power was rarely exercised, except upon the ground of error in fact or in law. By 2 and 3 Will. IV. c. 92, the court of delegates was abolished, and its jurisdiction was transferred to the King in council. And by 3 and 4 Will. IV. c. 41, and 6 and 7 Vict. c. 38, the sovereign is empowered to refer all appeals from ecclesiastical or other courts to the judicial committee of the privy council. See ADMIRALTY LAW; ECCLESIASTICAL COURTS.

DELEGATION (Fr. *délégation*, Lat. *delegatio*, from *de*, away, from, + *legare*, to send with a commission). The term formerly applied in Lombardy, Venetia, and the Papal States, both to the governing court of a province and to the province itself. There were nine delegations in Lombardy and eight in Venetia, each of which was presided over by a delegate, a vice-delegate, and various subordinates. In the States of the Church there were seventeen delegations originally established, but this number was not strictly adhered to. The delegate was always a prelate, and directly appointed by the Pope. If he was a cardinal, he was called a legate, and his province a legation. In Austria-Hungary the Austrian and Hungarian delegations constitute the deliberative assembly for the dual monarchy. See AUSTRIA-HUNGARY.

DE LE'ON, EDWIN (1828-91). An American journalist, diplomatist, and author, born in Columbia, S. C. In 1862 he became diplomatic agent in Europe, during the Civil War, and afterwards consul-general of the United States at Cairo. He wrote *Thirty Years of My Life on Three Continents; The Khedive's Egypt; Askaros Kassis, the Copt;* and *Under the Star and Under the Crescent.* His younger brother, THOMAS COOPER DE LEON (1839—), also born in Columbia, is the author of *Creole and Puritan* (1889), of parodies, including *The Rock or the Rye?* (1887), a travesty on Amélie Rives's *The Quick or the Dead?*, and of a volume of historical reminiscences, *Four Years in Rebel Capitals* (1893).

DELEPIERRE, dĕl'pê-âr′, JOSEPH OCTAVE (1802-79). A Belgian author. He was born in Bruges, and studied in Ghent. In 1849 he was appointed Belgian consul to London and filled that position until 1877. Besides editions of older works, such as *Aventures de Tiel Ulenspiegel* (2d ed. 1840) and *Macaronéana* (1852), he published: *Histoire littéraire des fous* (1860); *La parodie* (1871); *Tableau de la littérature de centon* (2 vols., 1875); and *L'enfer: Essai philosophique et historique* (1877).

DELESCLUZE, d*e*-lå'klụz′, LOUIS CHARLES (1809-71). A French politician and agitator, who took a prominent part in revolutionary conspiracies in the time of Louis Philippe, of the Republic of 1848, of the Second Empire, and the Third Republic. He was many times imprisoned, and in 1857 was deported to Cayenne, whence he returned in 1859 under the amnesty. In 1868 he started the *Réveil*, a most radical paper, advocating the ideas of the International. After the collapse of the Empire he organized the revolt against the Government of National Defense, and for this was arrested, but was soon released. Elected to the National Assembly, he resigned from that body on being chosen a member of the Commune, of which he was a conspicuously desperate and reckless leader during the siege of Paris. Seeing the collapse of the Commune, he sought and found death on the last barricade held by the revolutionists in the Rue d'Angoulême. His sufferings while a prisoner he has described in *De Paris à Cayenne, journal d'un transporté* (1869).

DELFF, Hugo Heinrich Karl (1840-98). A German philosophical writer, born at Husum in Schleswig. After studying at several German universities, he chose book-selling as a means of earning his livelihood, but devoted all his leisure to philosophical studies. His most important works include: *Ideen zu einer philosophischen Wissenschaft des Geistes und der Natur* (1865); *Welt und Weltzeiten: Eine Philosophie des Lebendigen und der That* (2 vols., 1872); *Die Hauptprobleme der Philosophie und Religion* (1886); and *Das vierte Evangelium* (1890).

DELFT (Dutch, ditched; connected with AS. *dælf*, ditch, from *delfan*, Dutch *delven*, to dig, OHG. *bi-telban*, to bury, Engl. *delve*). A quaint old town of the Netherlands, situated on the Schie, about six miles southeast of The Hague and about eight miles northwest of Rotterdam (Map: Netherlands, C 2). It is intersected by numerous canals lined with trees and contains a number of interesting buildings. The Prinsenhof, now converted into a museum, is noted as the place where William I. of Orange was assassinated on July 10, 1584. The Oude Kerk, a Gothic structure, dating from the fifteenth century, contains monuments of famous Dutchmen, including one of Admiral Tromp. The Gothic Nieuwe Kerk, dating from the fourteenth century, is surmounted by a tower 375 feet high, containing 500 bells. The church contains the family vault of the House of Nassau, the mausoleum of William I., and the remains of Hugo Grotius, a native of Delft, who has also been commemorated by a bronze statue. The town hall dates from 1618, and contains some interesting paintings. The educational institutions of Delft include a polytechnical school, with over 1100 students, and a training school for colonial officials. In former times Delft was especially famous for its earthenware, known as Delftware, and made in imitation of Chinese and Japanese porcelains. This industry, after a period of complete decline, has been revived of late. Delft contains arms and ammunition factories and carpet-mills. The town was founded in the Eleventh Century, and was almost destroyed in 1536 by a fire, and in 1654 by the explosion of a powder-magazine. Population, in 1900, 31,589; in 1904, 32,950.

DELFTSHAVEN, dĕlfts'hä'ven. An old town in South Holland, since 1886 unitel to Rotterdam (q.v.). The Pilgrim Fathers embarked at Delftshaven for Southampton, July 22, 1620.

DELGADA, dĕl-gä'dȧ. See Ponta Delgada.

DEL'HI, dĕl'lē. A division in the Punjab, British India (q.v.). It is divided into seven districts, has an area of 15,530 square miles, and is mainly agricultural. Capital, Delhi. Population, in 1891, 4,436,000; in 1901, 4,587,000.

DELHI or **DEHLI**. A city of India, capital of the division and the district of Delhi in the Punjab (Map: India, C 3). It is situated on the right bank of the Jumna, in latitude 28° 39′ N., and longitude 77° 17′ E., 954 miles and 870 miles by rail, respectively, from Calcutta and Bombay. It is partially surrounded by strong walls with bastions and ramparts. The European quarter is separated from the rest of the city by a canal. The streets in the native city are, with a few exceptions, narrow, crooked and far from clean. The mogul's palace, once one of the most sumptuous architectural monuments in the East, of which only a few buildings are left, still shows some traces of Oriental splendor. The Jumma Musjid, the principal mosque, is regarded as one of the noteworthy buildings of its kind in India, both on account of its dimensions and architecture. It was commenced in the seventeenth century by Shah Jehan. It has fine gateways, surmounted by minarets and massive doors decorated with brass arabesques. Other interesting mosques are those of Roshanudaulah, situated in the centre of the Chandni Chauk, the principal thoroughfare of Delhi, and surmounted by three gilt domes; the Fatehpuri Mosque, dating from the seventeenth century; and the Kalan Musjid, dating from the fourteenth century, and considered as a typical example of the architecture of that period. The Delhi College, founded in 1792, was closed in 1877, and its valuable endowment transferred to the more central institution of Lahore, but a number of native educational institutions remain, and numerous books in the Persian, Arabic, and Hindu languages are published at Delhi.

The city carries on an extensive trade in grain, and its bazaars are well stocked with shawls, costly embroidered stuffs, and jewelry. Delhi is an important railway as well as a financial centre. Since the demolition of part of the walls, the city has begun to assume a more European aspect, and it now has good lighting, a drainage system, and a good water-supply. Population, in 1891, 192,580; in 1901, 208,575. More than one-half of the inhabitants are Hindus and about two-fifths are Mohammedans.

The city of Indraprastha (ancient Delhi), unrivaled in its splendor among the cities of India, was situated on the opposite bank of the river. Its original foundations are supposed to date from the fifteenth century B.C. Its remains cover an area of about thirty miles in circumference. The authentic history of Delhi begins in 1193, when the city was taken by the Mohammedans. It was the centre of a mighty Mohammedan monarchy until it was conquered in 1398 by Timur. In 1526 Delhi was taken by Sultan Baber, who removed the capital to Agra, but under his son Delhi regained its former rank. In the latter part of the sixteenth century the city fell almost into utter decay, as the capital of the State was either at Agra or Lahore. Shah Jehan began the building of the modern city in 1638, and some of the first edifices of Delhi belong to that period. At the beginning of the eighteenth century the decline of the Mogul empire affected also the city of Delhi. In 1739 it was captured by the Persians, and, as a result of an attack by the natives on the invading army, many of the inhabitants were massacred and the city was despoiled of some of its finest treasures, including the Peacock Throne and the Koh-i-Nur diamond. In 1789 Delhi was captured by the Mahrattas, in whose possession it remained until 1803, when it was taken by Lord Lake, and has since remained in the possession of the British. The uprising of 1857, and the subsequent siege of the city, form some of the most stirring events in the history of the British occupation of India. The invasion of the city by a handful of rebels from the cantonment of Meerut on May 10, 1857, was a signal for a general uprising in the city, as well as in northwestern India, and the rebels were soon joined by the native troops. The Europeans were mercilessly cut down, and the large powder-magazine was exploded by the British officers, who were unable to defend it against the attacks of the natives. Europeans and friendly native troops began to arrive at the beginning of June, but it was not before September that the army of relief was strong enough for an assault on the city. On September 14 Delhi was entered by the British, but it was only after six days' fighting within the walls that the city was retaken. The British losses during the siege amounted to over 1000 killed and nearly 4000 wounded. The old Bahadur Shah, who was proclaimed Emperor by the mutineers, was exiled to Rangoon, and his death in 1862 marked the end of the Mogul dynasty.

Consult: Brown, *The Punjab and Delhi in 1857* (London, 1861); Chambers, *History of the Indian Revolt* (Edinburgh, 1859); Fanshawe, *Delhi Past and Present* (London, 1902); Wheeler, *History of the Delhi Coronation Durbar* (London, 1904).

DELHI. A village and the county-seat of Delaware County, N. Y., 66 miles (direct) west by south of Albany; on the Delaware River, and on a branch of the New York, Ontario and Western Railroad (Map: New York, F 3). It has a silk-mill and creameries. Pop., 1905, 1781.

DE'LIA. See GREEK FESTIVALS.

DE'LIAN PROBLEM. See CUBE.

DELIBES, de-lēb', CLÉMENT PHILIBERT LÉO (1836-91). A French composer, born at Saint Germain du Val, Sarthe. He studied at the Paris Conservatory, where he won many prizes, and in 1853 became accompanist at the Théâtre Lyrique, and organist at Saint-Jean et Saint-François. In 1865 he became second chorus-master at the Opéra, and in 1880 was made professor of composition in the Conservatory. In 1884 he became a member of the Institute, succeeding Victor Massé. Delibes became popular with his first operetta, *Deux sacs de charbon* (1855), and then wrote a number of comic operas and ballets, of which the most famous are: *Le roi l'a dit* (1873) and *Lakmé* (1883), operas; *Coppélia* (1870) and Sylvia (1876), ballets. They are famous for delicacy and brilliant, fairy-like orchestral effects.

DELIGHT OF MANKIND (Lat. *deliciæ generis humani*). A title given to the Roman Emperor Titus, in admiration of his mildness and virtues.

DELI'LAH (Heb., delicate). The name of a Philistine woman whom Samson loved. Her home was in the valley of Sorek. By her flattering blandishments, she obtained from him the secret that his great strength lay in his locks; and having cut these off while he lay asleep, she then treacherously betrayed the warrior, shorn of his strength, into the hands of his enemies. (Judges xvi., 4-31). See SAMSON.

DELILLE, de-lēl', JACQUES (1738-1813). A French didactic poet and translator, born at Aigueperse, June 22, 1738. He achieved extraordinary popularity in the eighteenth century, but is now hardly read or thought readable, save as he is typical of the lack of poetic inspiration in his generation. His translation of Vergil's *Georgics* (1769) was esteemed at least equal to the original, and *Les jardins ou l'art d'embellir les paysages* (1782, enlarged ed. 1801) was deemed immortal. He was elected to the Academy in 1772, but not admitted until 1774. After the outbreak of the Revolution he followed the Emigration. He lived for a time in Switzerland, where he published *L'homme des champs, ou les Géorgiques françaises* (1800). In 1801 he went to England, where he translated *Paradise Lost.* France could not spare him, and in that year requested him to return to his seat in the Academy and his professorship of Latin and belles-lettres in the University of Paris and the Collège de France, which he held till blindness intervened. This, however, did not check the stream of his poetic production, which in these last years included *La pitié,* in four cantos (1803); Vergil's *Enéide* (1805); *L'imagination,* in eight cantos (1806); *Les trois règnes de la nature* (1809); and *La conversation* (1812). He died in Paris, May 1, 1813. Consult Sainte-Beuve, *Portraits littéraires,* vol. ii. (Paris, 1864).

DELIQUES'CENCE (Lat. *deliquescere,* to melt away, dissolve, from *de,* down, away + *liquere,* to be fluid, liquid). The term applied to the property which certain substances have of absorbing moisture from the air and becoming damp, and even running into liquid. The substances possessing this property are said to be deliquescent. Caustic potash and the chlorides of calcium and magnesium are examples of deliquescent substances.

DELIR'IUM (Lat., literally, being off the straight line, or furrow, from *de,* off, away + *lira,* furrow). A derangement of mind during illness, in which the intellect and the judgment are perverted or lost, while the imagination and the passions are often excited, or at least left without control. The result is an incoherent or totally disordered course of action and speech, frequently attended by delusions, or unreasoning beliefs, which the sound mind at once perceives to have no foundation in fact. The patient is generally suffering from an acute disease, such as fever. Delirium may occur during the invasion of pneumonia, scarlet fever, smallpox, bubonic plague, or during uræmia, chorea, hysteria, epilepsy, etc. *Delirium tremens* (Lat., shaking delirium) is the result of long continued alcoholic intoxication, and may attack a 'moderate drinker' during a single excessive indulgence. Contrary to a very common belief, it is probably never caused by sudden withdrawal of liquor from one who is constantly indulging in drink. Delirium tremens is characterized by a restless, irritable state of the nervous system, rather than by furious paroxysms of excitement (though these are not rare); by constant though ill-regulated and ineffectual attempts of the patient to occupy himself; by spectral illusions of horrible, terrifying, or very rarely amusing objects, such as animals, snakes, goblins, etc., or hallucinations of vision and hearing; by tremors of the hands and tongue; by loss of appetite, nausea, and vomiting; and by great wakefulness, the want of sleep being often protracted over many days and nights, with constant excitement of the senses, and the prostration of the vital powers from deficient nourishment. In treating delirium tremens, bromides, chloral, rarely opium, strychnine, and other powerful drugs are used, with purgatives. Stimulants other than alcohol are frequently needed. The condition is very dangerous, as about 17 per cent. of the patients die; and the use of drugs, of restraint when the patients are furious, and the direction of nourishment must be under the administration of a physician. See ALCOHOL; MANIA.

DELIRIUM E′BRIO′SUM (Lat. *ebriosus*, addicted to drink, from *ebrius*, drunk). An old term used to denote either the delirium accompanying acute alcoholism, or delirium tremens. In the former there is exaltation, garrulity, boastfulness, delusions of a grandiose character, followed by violent verbal abuse, passion, and often fierce anger without cause, which prompts the inebriated individual to break furniture, glassware, panes of glass in windows, etc. Delirium tremens is described under DELIRIUM (q.v.).

DELIRIUM NERVO′SUM, or **TRAUMAT′ICUM** (Lat. *nervosus*, nervous; *traumaticus*, from Gk. *τραυματικός*, *traumatikos*, of wounds, from *τραῦμα*, *trauma*, wound). A term employed by Dupuytren to designate an attack of delirium with tremors, which frequently supervenes on severe bodily injuries, such as gunshot wounds, burns, and fractures—chiefly met with in large hospitals—in the case of persons of weakly constitution, and who are irritable and nervous, and have been intemperate in their habits. Delirium nervosum resembles delirium tremens, and is the forerunner of death in some operative cases.

DELIRIUM TRE′MENS. See DELIRIUM.

DELISLE, de-lēl′. See LISLE, GUILLAUME DE.

DELISLE, LÉOPOLD VICTOR (1826—). A French historian and bibliographer, born at Valognes. For many years he was connected with the Bibliothèque Nationale. In 1871 he was made director of the department of manuscripts, and in 1874 general director of the great library. His numerous works include: *Rouleaux des morts du IXème au XVème siècle* (1866); *Le cabinet des manuscrits de la Bibliothèque Nationale* (3 vols., 1868-81); *Inventaire général et méthodique des manuscrits français* (Vols. 1 and 2, 1876-78); and *Les Bibles de Gutenberg* (1894).

DELITZSCH, dā′lĭch. A town and important railway junction of the Prussian Province of Saxony, 15 miles north of Leipzig, on the right bank of the Lübber (Map: Prussia, E 3). It is an old but well-built town, still partially surrounded by walls. The castle, rebuilt in 1690, is now used as a female penitentiary. The manufactures include tobacco, sugar, syrup, shoes, and hosiery. In the neighborhood are rich coal-mines. The town is the birthplace of the famous naturalist Christian Gottfried Ehrenberg. Population, in 1900, 10,500; in 1905, 10,940.

DELITZSCH, FRANZ (1813-90). A German theologian, born and educated in Leipzig. He became professor of theology at Rostock in 1846, at Erlangen in 1850, and at Leipzig in 1867. He was one of the strongest exponents of what is called the Erlangen School, or the strictest orthodox theology. He interested himself in the conversion of the Jews, in this way utilizing his great knowledge of Hebrew and the Talmud; and his translation of the New Testament into Hebrew was widely circulated among the Jews of Galicia and Russia. This work, completed after a labor of almost forty years, is entitled *Die Bücher des neuen Bundes aus dem Griechischen ins Hebräische übersetzt* (1877). Besides a number of valuable commentaries on the Old Testament, and other theological works, he published some popular devotional writings, among which the following had a wide circulation: *Das Sakrament des wahren Leibes und Blutes Jesu Christi* (1844); *Vier Bücher von der Kirche* (1847); *Philemon, oder von der christlichen Freundschaft* (2d ed. 1858); *Handwerkerleben zur Zeit Jesu* (1868); *Ein Tag in Kapernaum* (1871); *Durch Krankheit zur Genesung* (1873).

DELITZSCH, FRIEDRICH (1850—). A German Assyriologist, a son of Franz Delitzsch. He was appointed extraordinary professor at Leipzig in 1877, ordinary professor at Breslau in 1893, and in 1899 professor of Assyriology in the University of Berlin. His lectures attained a wide popularity, and one of them, entitled *Der babylonische Ursprung hebräischer Ideen*, delivered in 1901, was attended by Emperor William II., who also gave a large sum toward the researches to be made in the territory of ancient Babylonia. In 1906 he lectured in the United States. He wrote: *Assyrische Lesestücke* (4th ed., 1900); *Wo lag das Paradies?* (1881); *Studien über indogermanische Wurzelverwandtschaft* 2d ed., 1884); *Assyrisches Wörterbuch zur gesamten bisher veröffentlichten Keilschriftlitteratur* (1887 et seq.); *Assyrische Grammatik* (1889); *Assyrisches Handwörterbuch* (4 vols., 1894-96); *Das Babylonische Weltschöpfungsepos* (1896); *Babel und Bibel* (1902; Eng. trans., 1903).

DELITZSCH. See SCHULZE-DELITZSCH.

DE′LIUS (Lat., from Gk. *Δήλιος*, *Dēlios*). A name given to Apollo, who was fabled to have been born on the island of Delos.

DELIUS, dā′lē-ōōs, NIKOLAUS (1813-88). A German philologist and Shakespearean scholar, born in Bremen. He studied at the Universities of Bonn and Berlin, visited England and France, and settled in 1841 in Berlin. In 1846 he removed to Bonn, where he lectured on Sanskrit, Romance, and English literature, and was professor at the University from 1867 to 1880. Among his writings those concerned with the criticism and interpretation of Shakespeare's works are the most important; above all, the great edition of the complete works, with a critical preface and explanatory notes, published 1854-61, and repeatedly thereafter. Besides this must be mentioned *Die Tiecksche Shakespeare-Kritik* (1846); *Der Mythus von William Shakespeare* (1851); *Ueber das englische Theaterwesen zu Shakespeare's Zeit* (1853); *Pseudo-Shakespearische Dramen* (1856-74). He also contributed valuable studies to the knowledge of Romance literature in the Middle Ages.

DELIVERY (OF. *delivrer*, Lat. *deliberare*, to free, from *de* + *liber*, free). The physical transfer of possessions. The term is commonly employed in the law to characterize such an act when performed with the purpose of creating or transferring a legal right. Its significance springs from the importance of physical possession as an element of ownership. In primitive society it is the principal, and, in its earlier stages, the controlling element in the conception of property. The metaphysical notion of ownership, dissevered from possession and even from the right of possession, belongs to a comparatively advanced stage in the evolution of legal ideas. At first, possession, if not theoretically identical with ownership, is at least attended with its legal effects and always tends in practice to supersede the more abstract right. Under such circumstances, there is only one way in which the title to property can be transferred, and that is by the actual transfer of the physical control over the property, and hence delivery of possession becomes the important fact in the assignment of legal rights over physical objects.

It is easy to see how this simple process, so convenient and appropriate in the case of chattels, came to be transferred to the conveyance of interests in lands. There was no way in which these interests, however temporary and limited in character, could be vested in another but by putting him into possession of the land itself, and thus we find the early method of conveyancing to be the transfer of the land by delivery. See FEOFFMENT; LIVERY OF SEISIN; SEISIN.

Though this method of conveying real property has been superseded on both sides of the Atlantic by more convenient methods, the notion of the significance of delivery has been transferred to the written instrument by which lands are now universally conveyed, and has even been extended to other transactions in which similar instruments are employed; while in the case of chattels delivery of possession is still the usual, and in many cases the essential mode of transfer. See DEED; GIFT; SALE.

While delivery usually contemplates the actual handing over of the subject matter of the transaction by the transferror, or party to be bound, to the transferee, or party to be benefited, it may equally be effected by any appropriate and manifest act whereby the deliveree is put in the same position of control over the thing as that which the deliveror held prior to the act. The possession thus assumed may be immediate and personal, or it may be by an agent or servant. The transfer of title to a house may, if so intended, carry with it the possession of the chattels therein, and the actual physical delivery of a key may constitute a delivery of securities in a strong box, or of a horse in a stable. So there may be a symbolical delivery, as of goods, by the transfer of the bill of lading or warehouse receipt describing them, or of money on deposit in a savings bank, by passing over the bankbook. There is also what is called a 'constructive' delivery, as where a part of a bill of goods is delivered for the whole, or where, a thing having been placed by the owner in the custody of a third person, the custodian agrees to hold it for the deliveree.

It will be noticed, however, that in no case is there a legal delivery by mere words indicating an intention to transfer the title, without some overt and significant act on the part of the donor or vendor, whereby he surrenders his control over the article. The nearest approach to such a case is that referred to in the article on DEED, where such a declaration of intention accompanies and explains an equivocal act, such as the laying down of an instrument on the desk of the deliverer or his inclosing it in an envelope addressed to the deliveree. See POSSESSION.

Consult: Pollock and Wright, *An Essay on Possession in the Common Law* (Oxford, 1888), and the authorities referred to under such titles as SALE; POSSESSION; TITLE; etc.

DELIVERY. See OBSTETRICS.

DEL'LA CRUS'CAN SCHOOL. About the year 1785, a number of English residents in Florence endeavored to beguile their leisure hours by writing verses, which they published under the title of *The Florence Miscellany.* The insipidity, affectation, and fantastic silliness of these productions transcend belief; yet such was the poetic destitution of the period that they soon found a crowd of admirers and imitators. Taking the name of an academy in Florence (see ACADEMY), the Della Cruscans presently began to print their lucubrations in England, chiefly in two daily newspapers called *The World* and *The Oracle.* "While the epidemic malady was spreading from fool to fool," as Gifford pungently says, "one of the brotherhood, a Mr. Robert Merry, came over from Florence, and immediately announced himself by a sonnet to Love." It was answered by a certain Anna Matilda, who (as was the custom) praised it immoderately in language even more absurd than Merry's own. According to Gifford, "the fever now turned to a frenzy; Laura, Maria, Carlos, Orlando, Adelaide, and a thousand other nameless names, caught the infection; and from one end of the kingdom to the other all was nonsense and Della Crusca." Retribution, however, came, for in 1794 Gifford produced his *Baviad,* and in 1796 his *Mæviad.* Rarely has literature witnessed such an excoriation. It completely killed the 'school,' and, indeed, it is only in these two poems that the memory of most of the unhappy Della Cruscan songsters has been preserved.

DELLINGER, dĕl'lĭng-ẽr, RUDOLF (1857—). A German composer of operettas. He was born at Graslitz, Bohemia, and was educated at the Conservatory of Prague. After conducting opera in Hamburg for a number of years, he was in 1893 appointed leader of the Court Opera in Dresden. His operettas entitled *Don Cesar* (1885), *Capitän Fracasse* (1889), and *Die Chansonnette* (1895), are deservedly popular.

DELLYS, dĕl-lēz' (Kabyle *Tedles,* Lat. *Rusucurrus*). A seaport town and important military post of Algeria, situated 49 miles east of Algiers, with which it is connected by rail (Map: Africa, E 1). It is divided into a European and a native port, and has a good roadstead. It contains a mosque and an industrial school, and carries on a considerable trade in grain, olives, and wine. Population of commune, in 1901, 13,977, including over 1000 French residents.

DEL'MAR, ALEXANDER (1836—). An American political economist, born in New York City, and educated at New York University. He founded the *Social Science Review,* and was its editor in 1864 to 1866, and in the latter year organized and was director of the United States Bureau of Statistics. In 1876 he was appointed mining commissioner of the United States Monetary Commission. His publications comprise: *The National Banking System* (1865); *The History of Precious Metals* (1880); *The History of Money in Ancient Countries* (1884); *The Science of Money* (1885); *Money and Civilization* (1886); *The History of Money in America* (1899); *Ancient Britain* (1900); *Worship of Augustus Cæsar* (1900); *Middle Ages Revisited* (1900); *History of Money in the Netherlands* (1903).

DEL'MENHORST. A town in the Grand Duchy of Oldenburg, 10 miles southwest of Bremen (Map: Germany, C 2). Wool-carding, yarn-spinning, jute-spinning, and the manufacture of cigars, ironware, cooking utensils, linoleum, bricks, and trimmed lumber constitute the principal industries. There are also important cattle and horse markets. Population, in 1890, 6828; in 1900, 16,573; in 1905, 20,136.

DELMONTE Y TEJADA, dâl-môn′tâ ê tâ-hä′dâ, ANTONIO (1783-1861). A Spanish-American historian. He was born at Santiago de los Caballeros, and studied law at the University of Santo Domingo. He participated in the campaign against Toussaint l'Ouverture, but in 1804 was compelled to seek refuge in Cuba, and ultimately settled at Havana as an official of the Government. He wrote a *Historia de Santo Domingo* (vol. i., Havana, 1853).

DELOCHE, de-lôsh′, MAXIMIN (1817-1900). A French archæologist. He was born at Tulle, and, after having studied law at Bordeaux, entered the Government service in 1840, was appointed to various offices in the Ministry of Public Works, serving also in Algeria from 1846 till 1850, and finally became director of one of its departments. He retired in 1880. In recognition of his numerous meritorious works in the field of history, archæology, and numismatics, he was elected a member of the Academy of Inscriptions in 1871. He died in Paris. Among his publications are: *Etienne Baluze, sa vie et ses œuvres* (1858); *Cartulaires de l'abbaye de Beaulieu* (1859); *Etudes sur la géographie historique de la Gaule, etc.* (1861-64); *La Trustis et l'antrustion royal sous les deux premières races* (1873); *Etudes de numismatique mérovingienne* (1890).

DELOLME, de-lōlm′, JEAN LOUIS (1740-1806). A Swiss jurist, born in Geneva, where he practiced law. Having given umbrage to the authorities by his publication, *Examen des trois points des droits*, he was obliged to take refuge in England, where, in spite of his literary activity, he lived for several years in great poverty. He returned to his native country in 1775. His principal work is *Constitution de l'Angleterre* (1771), which was translated into English by himself and passed through several editions. He also published, in English, *Parallel Between the English Government and the Former Government of Sweden* (1772); *History of the Flagellants* (1777); and an *Essay Containing Strictures on the Union of Scotland with England* (1787).

DE LONG, GEORGE WASHINGTON (1844-81). An American naval officer and Arctic explorer. He was born in New York City, graduated at the Naval Academy in 1865, and by 1873 had risen to be navigating officer of the *Juniata*, in which search was being made for the lost *Polaris*, the Arctic exploring steamer in which Captain Hall had sailed. To his enthusiasm for polar research thus kindled was due the *Jeannette* expedition, subsidized by James Gordon Bennett, which set out from San Francisco in 1879 with a company of thirty-three, commanded by Lieutenant-Commander De Long. The *Jeannette* was crushed in the ice north of Siberia, and the party, after traversing the ice on sledges, set out for the land in three boats, of which one was lost at sea. The one containing De Long reached the Lena River; but (except two seamen, who succeeded in reaching a settlement) her crew, including De Long, died of starvation. The third, which contained George W. Melville and Lieutenant Danenhower (qq.v.), arrived at the Lena in October, 1881, and, after months of search, found the bodies of De Long and his companions (March, 1882), which were brought to New York and interred with distinguished honors. Consult: De Long, *The Voyage of the Jeannette* (Boston, 1882); Danenhower, *The Narrative of the Jeannette* (Boston, 1882); and Melville, *In the Lena Delta* (Boston, 1885). See POLAR RESEARCH.

DELOO′. See DUYKER.

DELORAINE, de-lô-rān′, WILLIAM OF. The messenger in Scott's *Lay of the Last Minstrel*, despatched to the tomb of the wizard Michael Scott for the magic book.

DELORD, de-lôr′, TAXILE (1815-77). A French publicist, born at Avignon. He began his career as a journalist in Marseilles, and in 1837 settled in Paris, where he became a contributor to several journals, notably the *Charivari*, of which he was editor-in-chief for a number of years until 1858. Afterwards he was connected with the *Siècle* as literary editor. Elected to the National Assembly in 1871, he voted steadily with the extreme Radical Party. He published *Physiologie de la Parisienne* (1841) and *Les matinées littéraires* (1860), besides a number of critical and historical studies; but his principal work is a *Histoire du second Empire* (1868-75), which is a useful book of reference, and met with great success.

DELORME, de-lôrm′, MARION (1611-50). A notorious French courtesan. At an early period of her life she came to Paris, where her great beauty would easily have secured for her a good match had she not been inclined to a life of licentious intrigue. Almost all the distinguished men of the age were her lovers, among them Cinq-Mars, the great Condé, his brother the Prince de Conti, and the Duke of Buckingham. During the first disturbances of the Frondeurs, her house was the rallying-point of the chiefs of that party, and, in consequence, Mazarin was about to imprison her, when she suddenly died in 1650. A curious tradition sprang up in France during the next century, to the effect that Marion had not died, but had escaped to London; that she had returned to Paris in 1682; that she, meanwhile, had been twice married; and, finally, that she died in 1706, or, according to others, even as late as 1741. Victor Hugo has made her the subject of a drama, and Alfred de Vigny described her fate in his novel *Cinq-Mars*.

DE L'ORME, PHILIBERT (c.1515-70). One of the greatest architects of the French Renaissance. He belonged to a family of architects, and went to Rome in 1534 to study the ancient monuments. Going to Paris in 1539, he soon obtained important positions, directing the work at the Château of Fontainebleau (1543-59), and becoming architect to the King in 1546. He took a considerable part in the châteaux of Saint Germain and Chenonceaux, but his chef-d'œuvre at this time is the Château d'Anet (1552-59), which he built for Diana of Poitiers, a miracle of rich purity. After a period of disgrace, Catherine de' Medici employed him to design the Palace of the Tuileries (1563), the construction of which he continued until his death (see TUILERIES), and which was the mature expression of his genius. Consult: Pattison, *The Renaissance of Art in France*, vol. i. (London, 1879); Palustre, *La renaissance en France*, vols. i., ii (Paris, 1879-81); Vachon, *Philibert de l'Orme* (Paris, 1887).

DELORME, Pierre Claude François (1783-1859). A French painter, born in Paris. He was a pupil of Girodet, whose manner he imitated. His art embodies the classical tendencies of the school of David (q.v.). His most important canvases are: "The Death of Abel" (1810); "Hero and Leander" (1814); "Raising of the Daughter of Jairus" (1817); "Descent of Christ into Limbo" (1819), in Notre Dame de Paris; "Cephalus Carried Off by Aurora" (1822), in the Louvre; "Foundation of the Collège Royal by Francis I.," Versailles Gallery. He also executed mural paintings in the churches of Saint-Eustache, Saint-Gervais, and Notre Dame de Lorette, in Paris.

DELORT, de-lôr′, Charles Edouard (1841-95). A French painter, born at Nîmes. He abandoned his original intention to enter the army, and devoted himself to the study of art at the Ecole des Beaux-Arts in Paris, first under Gleyre and afterwards under Gérome. He attracted attention in the Salon of 1866 by his picture "Chloë," which is now in the museum at Nîmes. He received medals in 1875 and 1882, and was decorated with the cross of the Legion of Honor in 1889. Among the best of his other works are: "Embarkment of Manon Lescaut" (1875); "Hallali in a Market Place" (1878); "Capture of the Dutch Fleet by the Hussars of the Republic" (1882); "Return from Exile" (1889).

DE′LOS (Gk. Δῆλος). The smallest of the Cyclades, called in ancient times Asteria, Ortygia, Cynthus. It is situated between the islands Rhenea and Myconus. It is about three and one-half miles from north to south, and three-fourths of a mile from east to west. Near the centre rises the rocky mountain Cynthus, about 380 feet high; to the west and north of this hill is almost the only level ground of the island, and here was situated the sanctuary of Apollo and the ancient town. According to the mythological account it was at first a floating island, but was fastened to Myconus and Gyarus by Poseidon, that it might afford a refuge from the jealous Hera for Leto, who there brought forth Apollo and Artemis. From very early times Delos was a sacred island, the centre of the Ionian cult of Apollo, and the scene of a great festival, celebrated by the Ionians in the month Thargelion (May or June), and mentioned in the Homeric hymn to Apollo. Even the Persian general Datis, when on his way to attack Athens, spared this island and made a rich offering to the god. After the Persian wars Delos became the centre and treasury of the new league under the presidency of Athens, and when the league was transformed into the Athenian Empire the temples of Delos seem to have passed under Athenian control. In B.C. 426 the island was purified by the Athenians, who removed all the dead bodies to the neighboring island of Rhenea, and ordered that hereafter no birth or death should occur on this sacred spot. In B.C. 422 they even expelled all the inhabitants, but allowed them to return in the following year. After the fall of Athens, in B.C. 404, Delos seems to have regained its independence for a short time; but the Athenians soon recovered the suzerainty, and seem to have retained it until about B.C. 322, when it became a free community, a position which was maintained until about B.C. 166. During this period the island prospered greatly. The successors of Alexander vied with one another in gifts to Apollo, while its central position made Delos a natural centre of commerce. Nor did this prosperity decrease when the Romans once more placed Delos under Athenian rule, for at the same time all imports and exports were freed from taxation, and during the second and first centuries B.C. Delos was the seat of a large colony of merchants, Italian, Greek, and Eastern. It was a centre of the slave trade, but had few local industries, except the manufacture of a variety of bronze. Sacked during the Mithridatic wars (c. 87 B.C.), it never fully recovered, and by the middle of the second century A.D. was deserted by all except those connected with the temple. With the fall of heathendom, the island was deserted except by those who visited it to collect building material, or to burn its marbles into lime.

During the fifteenth and sixteenth centuries the island was plundered for the benefit of European collections, but scientific exploration began only in 1829 with the French scientific expedition under the direction of Blouet. In 1873 Lebègue explored the ancient shrine and grotto on Mount Cynthus; and in 1877 Homolle began excavations in the sanctuary of Apollo. Since then the French School at Athens has conducted numerous and successful campaigns, which have brought to light not only the sacred precinct with its temples, porticos, and altars, but also the wharves and warehouses, the bazaars of the merchants, the theatre, the gymnasium, and a number of private houses, belonging apparently to the prosperous period of the second century B.C. In sculpture the island has yielded some important archaic statues of the sixth century B.C., such as the "Nike" of Archermos, the statue dedicated by Nicandra, and some female figures similar to those found on the Acropolis of Athens, and, of later art, a fighting warrior and a fine copy of the "Diadumenos" of Polyclitus (q.v.), as well as many other works, often, unfortunately, in very poor preservation. The chief harvest has been in the inscriptions, many of which are still unpublished. In addition to the decrees and dedications always common in sanctuaries, these include long lists of the treasures of the temple and also an important series of accounts, showing the receipts and expenditures of the temple, carefully itemized, and throwing a flood of light on the financial administration of a Greek shrine. Consult: Lebègue, *Recherches sur Délos* (Paris, 1876); von Schoeffer, *De Deli Insulæ Rebus* (Berlin, 1889); Homolle, *De Antiquissimis Dianæ Simulacris* (Paris, 1885), and *Les archives de l'intendance sacrée de Délos* (Paris, 1886); *Bulletin de correspondance hellénique*, vol. i., et seq. (Paris, 1877, et seq.). Good summaries of the history and antiquities are to be found in Jebb, *Journal of Hellenic Studies*, i. (London, 1881); and Diehl, *Excursion in Greece*, English translation by Perkins (New York, 1893); consult also: Schoeffer, in Pauly-Wissowa, *Realencyklopädie der klassischen Altertumswissenschaft*, vol. iv. (Stuttgart, 1901). A *Carte topographique de l'île de Délos*, and a detailed account of the island are in preparation by Homolle.

DEL′PHI (Gk. Δελφοί, *Delphoi*). An ancient town of Phocis, Greece, celebrated for its oracle of Apollo. It was situated about eight miles north of an indentation in the northern shore of the Corinthian Gulf. In the Homeric poems it is always called Pytho. It was situated on the southern slope of Mount Parnassus, where above the steep and narrow valley of the Pleistos rise the twin cliffs of the Phædriadæ. These precipices are separated only by a narrow chasm, from which issues the famous fountain of Castalia (q.v.). The temple, theatre, and stadium were situated at the foot of the western cliff, and about them the town must have gathered, though the gymnasium and a sanctuary of Athena lay to the east. Below the terrace on which the town lay, the land slopes abruptly to the bed of the brook. The natural surroundings are full of wild grandeur; from underground caverns streamed cold vapors, and the region was liable to violent shocks from earthquakes.

Under these circumstances, the place seems early to have become the seat of a worship of the earth-shaker, Poseidon, and the earth-mother, Gæa. Somewhat later, but still at a very early date, the worship of Apollo was introduced, and took the place of these cults. Apollo was a prophetic god, and Delphi became the seat of an oracle, which soon attained great fame. At first the responses seem to have been given from the rustlings of the laurel, as at Dodona from the oak, but later, probably with the introduction of the worship of Dionysus, the orgiastic prophecy appears. The Pythia, a woman over fifty years old, after drinking from the holy spring, and chewing laurel-leaves, took her seat upon a tripod over a cleft in the ground, whence was believed to issue an intoxicating vapor. Her utterances were taken down and put into hexameters by poets attached to the temple. During the greatest prosperity of the oracle three women relieved one another in this exhausting task. At the head of the temple service stood two priests, holding office for life, and seemingly in charge of the oracle. The oracle was consulted by States and kings in matters of national policy, and also by private persons on all manner of personal matters, such as voyages, business ventures, marriages, and other details of daily life. Its fame brought it great wealth and many splendid offerings, among which those of Crœsus and Gelon of Syracuse were especially famous. In the earliest source, the Homeric hymn to Apollo, Delphi appears in dependence upon the Phocian city of Crisa, near the Corinthian Gulf, which controlled access from the sea, and through the later political history of the place this early claim of the Phocians to the control of the oracle keeps recurring until the conquest of Philip of Macedon. The power of Crisa led to the first Sacred War, in which the Amphictyonic Council (q.v.) of Thermopylæ first appears as a guardian of the oracle. In B.C. 590-589 Crisa fell, and the first celebration of the Pythian games occurred; in B.C. 582-581 the fort was captured, the harbor filled up, and the whole plain placed under a curse. On this occasion another celebration of the games occurred, and from this time they were celebrated every four years. In B.C. 548 the stone temple, said to have been built by Trophonius and Agamedes, was burned, and the priests at once collected subscriptions from all Greece, and even from foreign parts, for its reconstruction. The work was undertaken by the Alcmæonidæ, then exiles from Athens, who exceeded their contract by employing Parian marble for the east front. Some fragments of sculpture found by the French seem to belong to this building. During the Persian wars the oracle showed a pro-Persian spirit, though later the priests declared that supernatural aid had turned to flight a Persian plundering expedition. In spite of its prophecies of defeat, Delphi was richly rewarded by the Greeks from the Persian booty. During the fifth century Delphi was adorned by the Greek States with treasuries to contain their offerings, as well as with many works of art commemorative of victories over their enemies. About B.C. 373 the temple suffered severely, and once more collections were invited from the Greek States for its restoration, which does not seem to have been completed till B.C. 328. Before that time, however, an attempt of the Phocians to reassert their control of the oracle led to the Third Sacred War (B.C. 357-346), which ended in the triumph of Philip II. of Macedon (q.v.). About B.C. 300 Delphi passed into the power of the Ætolian League, and when, B.C. 278, the Gallic invasion was repelled, we hear once more of the supernatural powers that drove back the robbers from the Temple of Apollo.

During the years that followed Delphi seems to have lost much of its old importance, though the inscriptions show that offerings were still made there, and honors bestowed on benefactors of the community. Under the Romans it enjoyed only spasmodic prosperity. One Pythia sufficed for the inquirers of the oracle, and while some of the emperors endeavored to restore some of the fallen splendor, others found in the mass of statues and works of art a convenient source for the decoration of the capital. Nero is said to have carried off 500 statues, while Constantine, along with many other treasures, removed to Constantinople the serpent column which had formed part of the offering after Platæa, and still bears the names of those Greek States which fought against the Persians. Later Delphi became the site of a Christian church, but the ruins finally vanished, and until 1892 the site was occupied by the village of Castri. In that year the French School at Athens, under the direction of Homolle, began excavations, which have resulted in laying bare the entire sacred precinct, including many treasuries and other buildings, as well as the altar, temple, theatre, and stadium. The inscriptions found number over 3000, many of them documents of great importance for the history of Greece. The sculpture also has thrown much light upon the history of art during the later sixth and early fifth century B.C., while it seems almost certain that in a marble statue we have a contemporary copy of a bronze by the great Lysippus. The reports of these excavations are to be found in the *Bulletin de correspondance hellénique*, vols. xvii. et seq. (Paris, 1893, et seq), and the *Comptes rendus de l'Académie des Inscriptions et Belles Lettres* (Paris, 1893 et seq.). Consult also: Mommsen, *Delphika* (Leipzig, 1878); Pomtow, *Beiträge zur Topographie von Delphi* (Berlin, 1889); and Hiller von Gaertringen and Pomtow, in Pauly-Wissowa, *Realencyklopädie der klassischen Altertumswissenschaft*, vol. iv. (Stuttgart, 1901).

DELPHI. A city and the county-seat of Carroll County, Ind., 60 miles north by west of Indianapolis; on the Wabash River, and on the

Wabash, and the Chicago, Indianapolis and Louisville railroads (Map: Indiana, C 2). It has good water-power and contains lime-works, planing and flour mills, canning factory, carriage and wagon works, paper-mills, etc. Population, in 1890, 1923; in 1900, 2135.

DEL'PHIN CLASSICS (Lat. *delphinus*, dolphin, ML. dauphin of France, whose crest bore three dolphins, from Gk. *δελφίς*, *delphis*, *δελφίν*, *delphin*, dolphin). A famous edition of the Roman classics, published in France in the seventeenth century. It was prepared by thirty-nine of the best scholars of the time, under the editorship of Bossuet and Huet, tutors to the dauphin (q.v.), son of Louis XIV. The title-pages bear the words, "*In usum Serenissimi Delphini,*" and hence the name. They comprise 64 volumes (1674-1730). The Delphin Classics possess little value in the eye of a scholar of the present day.

DELPHINE, dĕl'fēn'. A romance by Madame de Staël (1803), and the name of its chief character, a rich young widow, who thinks herself strong enough to defy public opinion, but is finally crushed by it. In some respects the work is in the nature of a personal confession.

DELPHIN'IA. See GREEK FESTIVALS.

DELPHIN'IUM. See LARKSPUR.

DEL'PHOS. A city and railroad centre in Allen and Van Wert counties, Ohio, 15 miles northwest of Lima; on the Miami and Erie Canal, and on the Pennsylvania Company, Toledo, Saint Louis and Western, Northern Ohio, and other railroads (Map: Ohio, B 4). It has railroad-shops, foundry, can-factory, and manufactures of wood. Settled in 1834, Delphos was incorporated in 1851, the charter of that year being now in operation. Its government is administered by a mayor elected every two years and a municipal council. The city owns and operates its water-works. Population, 1900, 4517; 1906 (local est.), 4648.

DELPINO, dâl-pē'nō, FEDERIGO (1833-1905). An Italian botanist, born at Chiavari (Genoa). He studied at the University of Genoa, became an official in the customs department, and in 1871 was appointed professor of natural history in the School of Forestry at Vallombrosa. In 1875 he was called to the chair of botany at the University of Genoa, and in 1894 to a similar chair and the curatorship of the botanical gardens at the University of Naples. His publications, which have contributed much to the study of plant biology, include *Sulla darwiniana teoria della pangenesi* (1869); *Teoria generale della fillotassi* (1883); and *Funzione mirmeofila nel regno vegetale* (2 parts, 1886-88).

DELPIT, dĕl'pē', ALBERT (1849-93). A French novelist and dramatist. He was born in New Orleans, the son of a wealthy merchant, and at an early age was sent to France to complete his studies. Devoting himself to literature, he first became a contributor to some ephemeral journals founded by the elder Dumas, toward the end of the Second Empire. Several poetic productions were honored with prizes by the Academy. These were *L'apothéose de Lamartine* (1869); *L'invasion* (1871), a volume of verse; and *Le repentir, ou récit d'un curé de campagne* (1878). His earlier dramatic efforts did not meet with success, but *Le fils de Coralie* (1880), dramatized from his novel of the same title, was received with great favor, and several of his subsequent dramatizations held the stage for some time, especially *Le père de Martial* (1881). He was, however, at his best as a novelist. Among his productions in this field, for the most part descriptive of life in fashionable society, and many of which appeared first in the *Revue des Deux Mondes*, are: *La vengeresse* (1874); *Les fils de joie* (1877); *Le mariage d'Odette* (1880); *La Marquise* (1882); *Les amours cruelles* (1884); *Solange de Croix-Saint-Luc* (1885); *Mademoiselle de Bressier* (1886); *Thérésine* (1888); *Disparu* (1888); *Comme dans la vie* (1890); *Belle madame* (1892). A collection of poems appeared under the title *Les Dieux qu'on brise* (1881). During the Franco-German War he entered the army, and, serving with distinction, was decorated with the Legion of Honor (1871). He died in Paris.

DELPIT, EDOUARD (1844—). A French author and journalist, born in New Orleans. He studied in France, where he was naturalized in 1868, and in 1873 became sub-prefect of Nérac. Subsequently he assumed control of the *Union Nationale*, a newspaper of Montpellier. He published a volume of poems, *Les mosaïques* (1871), and *Paule de Brussange* (1887); *La Vengeance de Pierre* (1888); *Chaîne brisée* (1890); *Marcienne* (1894); *Sans merci* (1898); *La talion* (1899); all works of fiction.

DEL POLLAJUOLO, dĕl pŏl'lȧ-yōō-ō'lō, SIMONE. See POLLAIUOLO.

DEL RIO, dĕl rē'ō (Sp., of the river). The county-seat of Val Verde County, Tex., 170 miles west of San Antonio; near the Rio Grande and on the Galveston, Harrisburg and San Antonio Railroad (Map: Texas, D 5). It has cotton-gins, a woolen factory, and other industrial establishments, and is the centre of a fruit-growing region, the productiveness of which is secured by irrigation. It has also stock-raising interests. Pecans, wool, hides, live stock, and fruit constitute the important exports. Population, about 2300; 1906 (local est.), 7500.

DELSARTE, dĕl-särt', FRANÇOIS ALEXANDRE NICOLAS CHÉRI (1811-71). A French-American musician, born in Solesmes, France. He was a pupil of the Conservatoire, was for a time a tenor singer in the Opéra Comique, composed a few melodies, and wrote several romances; but is chiefly known as a teacher in singing and declamation. He sought, by an elaborate system, to present the art of expression as a complete science. His theories have been widely adopted, and are handed down mainly by tradition, as Delsarte wrote very little about them.

DELSARTE SYSTEM. See GYMNASTICS.

DEL'TA (Lat., from Gk. *Δέλτα*, fourth letter of the alphabet, anything shaped like the letter Δ, from Heb. *daleth*, door, name of the fourth letter of the alphabet). An alluvial plain occurring at the mouth of a river. The name was applied originally by the Greeks to the land area at the mouth of the Nile from the resemblance in shape to their letter Δ. All rivers carry finely divided sand and mud in suspension, and, as their currents are checked upon entering quieter waters, the solid particles are deposited upon the bottom of the channels near the river-mouths. The deposit gradually increases in area and also in thickness until it reaches the surface, and then by floods and by growth of vegetation it is raised beyond the limits of high water. At the head of each land area thus built up, the river divides into diverging branches, forming a triangle, the base of which fronts upon the sea. A delta may occur at the junction of two rivers or at the entrance of a river into sea or lake; a fan-shaped deposit resembling a delta is sometimes found, also, where a river debouches from a mountainous region upon a plain. The large deltas are found at the mouths of great rivers which discharge into comparatively quiet seas. Coastal currents and strong tidal action remove the river deposits before they accumulate to any considerable thickness. The area of a delta varies with the size of the river, the amount of sediment carried and the length of time it has been deposited, and the relative quietude of the sea. The combined delta of the Ganges and Brahmaputra in India occupies more than 50,000 square miles, and the deposit has been found in places to be nearly 500 feet thick; that of the Nile is 200 miles wide at the base of the Mediterranean Sea and 100 miles long. The Mississippi delta is irregular in form, but it affords a fine illustration of the manner in which a river extends its channel seaward. Its area is about 12,300 square miles, and it is advancing into the Gulf of Mexico at the rate of about 260 feet a year. In Italy the Po has constructed a delta so rapidly that the city Adria, which in ancient times was a port of sufficient importance to have given its name to the Adriatic Sea, is now about 15 miles inland. Delta lands are usually fertile, but by reason of their low elevation they are unhealthful and their cultivation is hindered by inundations during storms and floods. Consult Geikie, *Text-Book of Geology* (London, 1893). See RIVER; SHORE.

DEL′TOID MUSCLE. See MUSCLE.

DELUC, de-lṳk′, JEAN ANDRÉ (1727-1817). A Swiss geologist and meteorologist. He was engaged in mercantile pursuits until nearly fifty years of age; but within that time, assisted by his brother, he collected a fine museum of mineralogy and natural history. He removed to England in 1773, was made a fellow of the Royal Society, and appointed reader to Queen Charlotte, a position which he held for many years, and which afforded him ample time for study. He invented a hygrometer, a portable barometer, etc., and carried out many interesting experiments in physics and meteorology. His principal geological work is *Lettres physiques et morales sur les montagnes et sur l'histoire de la terre et de l'homme* (1778). In this work he endeavors to reconcile the Mosaic account of creation with the data of science by extending the six days of Genesis to so many geological epochs.

DELUGE (OF., from Lat. *diluvium*, flood, from *diluere*, to wash away, from *di-*, away + *lucre*, to wash). A flood of waters supposed by many peoples to have submerged the whole earth, or a large part of it, in primeval times, involving the destruction of all, or nearly all, life upon the planet. The most unmistakable evidence of a belief in such a flood is found in the literary remains, not only of the ancient Hebrews, but also of India, Persia, Babylonia, Syria, Asia Minor, and Greece. In one form or another, it also seems to have existed among the aborigines of America and Polynesia, according to the testimony of Christian missionaries, whose accounts, however, cannot always be accepted without caution. On the other hand, there is practically no trace of a flood story in Africa, not even among the ancient Egyptians, though an earlier form of one may have been familiar in the Nile Valley. Aside from Greece, and possibly Lithuania, there is none in Europe.

Of course the most obvious way to account for this widespread story is to suppose that there really was a flood. The fact that the Bible gives a detailed and intelligible account of one was formerly generally regarded by Jews and Christians as unquestionable evidence that it occurred; and the story of it in other nations was considered remarkable confirmation of the Bible narrative. The organic remains found everywhere in the rocks of the earth's surface were also held to prove that the waters had covered every known country and risen over the highest hills. With the progress of geology it became evident that most of the stratified rocks demanded an earlier origin than a few thousand years, and the influence of the deluge was consequently restricted to the slightly altered superficial deposits. But many of these were found to belong to a period vastly anterior to any historical epoch, and to have been produced by a long-continued action under uniform conditions, viz. regional glaciation, which was most active during that portion of geological times known as the Glacial Period. Consequently, there arose a tendency to regard a Noachian deluge as having been of merely local extent, and this explanation was adopted by certain commentators on the narrative of Genesis. At the present time the most important discussion of the subject belongs to the department of comparative religion and mythology.

By far the earliest and most important of all deluge stories outside of the Bible is the Babylonian. Through the excerpts from Berosus (c.330-260 B.C.), made by Alexander Polyhistor (died) c.40 B.C.), and preserved by Josephus, Eusebius, and Georgius Syncellus, one version of the Babylonian story has long been familiar. It relates how, in order to escape the flood, the Babylonian King, Xisuthrus, was commanded to enter a vessel with wife, children, friends, and a pilot, and to steer 'toward the gods'; and how, when the waters had subsided, he sent out birds three times, grounded on a Kordyanian mountain in Armenia, disembarked, sacrificed to the gods and was translated. In 1872 George Smith discovered another version, forming the eleventh tablet of the Gilgamish epic. According to this story, Anu, Bil, Ninip, and Innugi sent out a destroying flood (*abubu*), but Ia, determined to save Uta-napishti of Shurippak, advised him to 'build a house, to construct a ship,' and to take with him into it 'seeds of life of all kinds.' He accordingly constructed his house, or boat, coated it within and without with bitumen (*kupru*), and made apartments in it. His possessions, family, relatives, laborers, the cattle and the beasts of the field, Uta-napishti brought into the house. Then the rain fell, the storm arose, and darkness covered the earth. All living beings were destroyed, except those in the house. On the seventh day Uta-napishti opened the window, and soon the ship grounded on the mountain of Nizir. Seven days later he sent out a dove, a swallow, and a raven. The dove and the swallow returned, the raven did not. Uta-napishti offered a sacrifice on the mountain, and the gods 'smelt the pleasant odor.' Ia rebuked Bil for ordering such a deluge, when he might have punished men by beasts, famine, or pestilence; and Ishtar, who had already during the deluge expressed her sympathy with mankind, now lifted up her gems made by Anu (probably the rainbow), which would remind her forever of the flood. Ia pacified Bil's disappointment at the deliverance of Uta-napishti; and Bil himself went on board the ship and announced that Uta-napishti and his wife were thenceforth to be gods and live 'afar off, at the mouth of the rivers.' These tablets containing the Gilgamish epic were found in the library of Assurbanipal (B.C. 668-626) at Kuyunjik; but they were only copies of originals found in turn by Assurbanipal's scribes in the temple archives at Uruk (modern Warka). Several fragments have since been found, giving the dimensions of the ark, and directions concerning food, treasures, men, and animals to be taken into it. Especially interesting is a tablet published by Peiser (*Zeitschrift für Assyriologie*, Leipzig, 1889), giving a map of Babylonia, surrounded by the ocean at the time of Uta-napishti 'in the year of the great serpent,' and probably dating from the ninth century B.C. The earliest reference to the flood is in a fragment published by Scheil (*Receuil de travaux*, Paris, 1878), dated the 28th of Shebat of the year when Ammi-zadugga (B.C. 2133-2098) built the fortress of Ammi-zadugga. The hero of the flood (*abubu*) is here called Atra-hasis, which, reversed (Hasis-atra), is evidently Berosus's Xisuthrus. A fragment likewise referring to Atra-hasis is found in *Keilinschriftliche Bibliothek*, vol. vi. (Berlin, 1900). As even Scheil's fragment appears to be a copy of an older original, the flood story is likely to have existed in several versions in the third millennium B.C.

The narrative in Genesis (chaps. vi.-ix) is regarded by the modern critics as made up of two versions interwoven. This was recognized by Jean Astruc (q.v.) as early as 1753. Using as a clue the divine names Yahweh and Elohim, he roughly outlined the two accounts. At the present day his intuition has been widely accepted, and scholars proceed to rearrange the material and assert that the Yahwistic narrative is found in Gen. vi. 5-8, vii. 1-5, 7-10, 12, 16b, 17, 22, 23; viii. 26, 3a, 6-12, 13b, 20-22. The flood is represented as sent because of man's wickedness. It is occasioned by a rain lasting forty days. Noah is saved with his family in an ark, or house. With him are a pair of all unclean animals, and seven pairs of all clean animals. The flood comes after seven days and destroys all living things on the earth. At the end of forty days Noah sends out a raven, which does not return; then a dove, which returns with an olive twig; and, after seven days, the dove is again sent out, and this time does not return. Seven days later Noah disembarks, builds an altar, and offers a sacrifice of which Yahweh smells the 'rest-giving odor,' and promises not to destroy the world again. Portions of the priestly narrative, as another of the main sources of the Hexateuch is named, are found in Gen. vi. 9-22; vii. 6, 11, 13-16a, 18-21, 24; viii. 4, 5, 13, 14-19; ix. 1-17. Noah is represented as a just and perfect man whom Elohim desires to save, and therefore commands to build an ark, giving its exact measurements. Noah is to take into it his family and of all living beings a pair. The flood is brought about by the subterranean waters of the great abyss breaking through the openings in the earth's crust and the windows of heaven being opened. It begins in the 600th year of Noah's life, on the 17th (or more probably, according to the Greek version, the 27th) day of the second month. It increases during 150 days, or five months of a solar year, and begins to decrease in the seventh month. The ark then grounds on one of the mountains of Ararat (Uratu, see CHALDIANS). The waters decrease until the tenth month, when, on the first day, the tops of the mountains are seen. On the first day of the first month in the 601st year of Noah's life the ground is dry, and on the 27th of the second month, consequently after a full solar year, Noah leaves the ark, and is blessed by Elohim, who points to the bow in the sky as a guarantee that a flood shall not again occur.

The striking similarity between the Genesis narrative and the Babylonian account is manifest, and has been explained in two ways. Both records have been thought to be independent developments of an old Semitic tradition; and the one has been said to be copied from the other. Those who believe that the Hebrew narrative is taken from the Babylonian think that the age of the two Hebrew versions of the deluge story can be approximately determined. There are indications that the Yahwistic scripture originally did not contain this tale, but traced the history of existing tribes back to their earliest progenitors without the interruption of a flood. The evident dependence upon a Babylonian original, and the first acquaintance with the waters of Noah in the work of Deutero-Isaiah, also point to a Jew living in Babylonia, possibly at Uruk, not long before B.C. 540, as the author who inserted in the Yahwistic document the story of the flood. His original seems to have been more like the Gilgamish epic than the Berosian story, as the regard for the number seven, the rain, the cover of the ark, the bitumen, and the sacrifices indicate. The priestly editor of the Pentateuch, who may have been none else than Ezra (see HEXATEUCH), apparently supplemented this account by another familiar to him, showing a somewhat greater affinity to the Sippara version found in Berosus, and Scheil's fragment, in the fourth century B. C. Absence of polytheism in the Hebrew is an unquestionable advance in thought, but it was not made without a sacrifice. Instead of a divided council of gods in which, through Ishtar and Ia, sympathy with the whole human race found fine expression, and mercy won the day over justice unmollified by kindness, the one all-powerful God became responsible for the ruthless destruction of life, and His partiality to those finding favor in His eyes became accentuated.

As to the origin of the Babylonian story, and also of the Hebrew narrative, if it be independent of the former, it has been maintained by some scholars that an actual occurrence, such as the incursion of a tidal wave through an earthquake, the destruction of a single city through a rainstorm, the flooding of some district from a system of canals not properly protected, or the annually recurring inundation of a river, may have given rise to it. But it is far more probable that the Babylonian account, at any rate, originated in a myth describing the passage of the sun-god in his boat through the heavenly ocean. When the present order of the world was regarded as the creation of the sun-god, after a successful conflict with the earth-encircling ocean, it is natural that this myth should, in course of time, take the form of a deluge story relating the escape of a solar hero in the year of the great serpent. This conclusion is also indicated by the fact that the story of the flood is told on the eleventh tablet of a series manifestly representing the course of a solar personage through the signs of the zodiac. In the great cosmic year the sun-god meets the cataclysm of waters in Aquarius, as in the solar year he encounters in Shebat, the eleventh month, the inundation of the river.

This mythical origin is believed to be confirmed by the flood stories of Greece, India, and Persia, as well as by the American and Polynesian accounts. The story of Deucalion's flood is known to us through Pindar (died c.440 B.C.), *Olymp.* ix. 37 sqq.; and Ovid, *Metamorphoses* l., 240; that of Ogyges through Nonnus (c.400 A.D.), *Dionysiaca*, iii., 96; that of Dardanus also through Nonnus, ibid., iii. 215 sqq. Deucalion means 'the little Zeus,' and this young sun-god steers in his ship for Parnassus, the mountain of the gods. The Phrygian myth, of which the bronze coins of Apamea bear witness, in the third century A.D., has evidenly been influenced by the Jewish account, as the name Noe shows; and the same is true of the Syrian story in Lucian's *De Dea Syria*, xii. On the other hand, the Indian flood story is quite independent of the Semitic. It is found in its earliest form in *Sátapatha-brāhmana* (c.600 B.C.); then in the *Mahābhārata* and *Bhagavata Purāna*. Mann, son of Vivisvat, is a solar hero. His divine character is shown by the fact that after the flood he creates not only a new human race, but even gods. Brahma in the form of a fish carries him through the waters. The Iranian story (*Vendidad*, ii. 46 sqq.) is in too fragmentary a condition to permit a conclusion. It is uncertain whether the flood is in the past or in the future. Yima seems to be identical with Mimer; if so, the myth belongs to a different order. The medium through which the Mexican, Peruvian, and Cuban flood stories have come to us renders it difficult to determine their original form; but the somewhat better authenticated Polynesian stories seem beyond a doubt to have their origin in a sea-myth. Consult: Usener, *Die Sintflutsagen* (Bonn, 1899); Andrea, *Die Flutsagen ethnographisch betrachtet* (Brunswick, 1891); Dillmann, *Commentary on Genesis* (Leipzig, 1892); Wright, *Geological Confirmations of the Noachian Deluge* (Oberlin, 1902); Murad, *Ararat und Masis* (Heidelberg, 1901); Vail, *The Deluge and its Causes* (Chicago, 1905).

DELUSION. See Insanity.

DELVAU, dĕl'vō', Alfred (1825-67). A French author. He was born in Paris, and after having been secretary to Ledru-Rollin in 1848, while the latter was Minister of the Interior, he devoted himself entirely to literary pursuits. He became a prolific writer and produced works of the most varied description, among which his skillful delineations of Parisian customs and curious phases of life are the most interesting, and may lay claim to some merit as contributions to the local history of civilization. Of these may be quoted: *Grandeur et décadence des grisettes* (1848); *Les dessous de Paris* (1860); *Histoire anecdotique des cafés et des cabarets de Paris* (1862); *Les Cythères parisiennes, histoire anecdotique des bals de Paris* (1864); *Les heures parisiennes* (1866); *Les lions du jour* (1867);. He also published: *Les murailles révolutionnaires* (1851), a curious collection of decrees and proclamations, placarded during the Second Republic; *Au bord de la Bièvre, impressions et souvenirs* (1854); *Gérard de Nerval, sa vie et ses œuvres* (1865); *Henri Murger et la Bohème* (1866); and *Les Sonneurs de sonnets, 1640-1866* (1867).

DELVAUX, dĕl'vō', Laurent (1695-1778). A Flemish sculptor. He was born in Ghent, and studied his art under Gery Heydelberg and Dieudonné Plumier in Brussels. In 1717 he went to London, where he spent nine years and executed numerous works for churches and palaces, partly in conjunction with the sculptor Pieter Scheemaecker, of Antwerp. From 1727 to 1733 he studied antique art in Italy, and, after his return was appointed Court sculptor to the Emperor Charles VI. He afterwards settled at Nivelles, and there practiced his art up to the time of his death. His productions, characterized by vigorous treatment, include: A colossal statue of Hercules, in the old royal palace in Brussels; mausoleum of Leonhard van der Noot, in the Carmelite church, Brussels; a pulpit, representing the "Tree of Life," in the Cathedral in Ghent, the best specimen of Flemish sculpture in the eighteenth century; statue of St. Livin, in the Museum in Ghent.

DELVIGNE, dĕl'vē'ny', Henri Gustave (1799-1876). A French soldier and inventor, born in Hamburg. He became a captain in the French infantry service, from which he resigned on the outbreak of the Revolution of July (1830). In 1826 he invented a rifle known by his name. In this rifle the chamber was smaller than the bore, with which it was connected by a spherical surface equal in radius to the ball used. The powder was poured from the muzzle into the chamber, upon which the ball rested when dropped into the bore. The ball was then made to take the rifling grooves by ramming. This invention marks an important step in the improvement of the rifle. Delvigne also devised some life-saving apparatus, particularly life-rockets. His publications include *Exposé d'un nouveau système d'armement pour l'infanterie* (1836).

DELYAN'NIS, or **DELIJANNIS,** Theodoros (1826-1905). A Greek statesman, born at Kalavryta, in the Peloponnesus. He entered the Government service in 1843, and was rapidly promoted. In the Cabinets from 1863 to 1878 he held office, either as Minister of Foreign Affairs, or of Finances, or of Worship and Instruction. He was the representative of Greece at the Berlin Congress in 1878, and obtained an extension of territory for his country. In 1885 he formed a new Ministry, but his policy led to a blockade of the Greek coast by a fleet of the great Powers, and he resigned in 1886. He was Prime Minister again in 1890-92, but his mismanagement of finances led to his dismissal. He held the office a third time from 1895 to 1897, when he involved Greece in the war with Turkey, and was obliged to resign. He was premier again in 1902-3 and 1904-5. On June 13 of the latter year he was assassinated by a supposed gambler whose class interests the prime minister had antagonized.

DEMADES, dĕm-ā'dēz (Gk. Δημάδης). An Athenian orator and unscrupulous politician of the fourth century B.C. He was a leading member of the Macedonian party, and for the twelve years preceding Alexander's death a leader in Athens with Phocion. When Antipater was advancing on Athens in B.C. 322, Demades and Phocion were sent as ambassadors to him. Their acceptance of the terms offered was made the basis of a charge that they had been bribed; some years later Antipater discovered that Demades had been false to him, and put him to death. None of his speeches are extant; in antiquity there were current under his name fourteen orations, but they were all recognized to be spurious. Extracts from one of these (Περὶ Δωδεκαετίας, *Peri Dōdekaetias*) are edited by Haupt in *Hermes*, vol. xiii., pp. 498 et seq. We have also a collection of sayings attributed to him—*Demadea*. Consult Blass, *Attische Beredsamkeit*, iii. (Leipzig, 1887-93).

DEMAND. A technical term of the common law, signifying a legal claim or obligation. It is defined by Lord Coke as "a term of law, of an extent greater in its signification than any other word except claim" (Co. Lit. 291). In addition to the claims enforceable by actions, such as contracts, debts, obligations, etc., it includes, as well, all rights enforceable by entry, by seizure of goods, or by any other act. A release of all demands, therefore, is the most comprehensive release that can be given. The usual form of 'general release,' as it is called, is to release "all claims and demands whatsoever." See RELEASE.

The term demand is also employed in law in a narrower sense, derived from its general signification of a request, or summons, addressed to another in legal form, calling upon him to perform a legal duty which he owes to the demandant. Such a demand is frequently necessary to fix an inchoate legal obligation and to entitle the claimant to bring an action for its enforcement. Thus, under ordinary circumstances, no right of action arises for a breach of promise to marry unless a previous demand can be shown, and the same is true of all contract obligations in which the time of performance is not definitely fixed, as well as of others in which the time is not a material element. So, in other classes of rights, a demand and its refusal are frequently necessary to give to a wrongful act the sharpness and definiteness requisite to make a legal remedy available. For example, where goods are wrongfully detained by a finder, or by any other person whose original possession thereof was lawfully acquired, he must refuse a demand for them before he becomes liable in trover for a conversion; and so, before abating a nuisance, either personally or by action, a demand must usually be made upon the person maintaining it.

There are other cases in which, though a definite default has been made, entitling the injured party to sue without further notice, a demand for performance may yet be necessary to enable him to avail himself of some more drastic remedy; as in the case of a failure to pay rent at the stipulated time, though an action will lie for the breach of contract, the landlord cannot enter for breach of condition and put an end to the lease without previous demand. It should be added that, in all cases in which a demand is requisite to fix a legal liability, the requirement is dispensed with if the party in default has put it out of his power to comply with it, and in some jurisdictions the courts have gone so far as to hold a demand unnecessary in all cases in which it would probably have been unavailing. See BREACH; CONVERSION; LIABILITY; QUASI CONTRACT; and consult the authorities referred to under these titles.

DEMAND AND SUPPLY. It is a familiar axiom of political economy that price depends upon demand and supply. Simple as the proposition appears, it has been the subject of interminable dispute because of the inevitable tendency to make of the rule a sweeping generalization applicable to all times and all places. None the less it remains a convenient form of stating the phenomena which determine market price. If in a given market the supply of goods is increased, prices cannot be maintained. If, on the other hand, the demand increases with a stationary supply, prices will rise. If, in the foregoing statement, there is little ambiguity about the word supply, which means a certain physical quantity of goods, it cannot be said that the notion of demand, a psychological factor, is so simple. Since demand is not merely desire, but is always associated for the purpose of economic reasoning with the ability to satisfy the desire, it is clear that the volume of demand depends itself upon the price. There are certain areas of demand which generally grow larger as the price diminishes. In the first instance, when supply is increased, larger areas of demand must be reached in order to effect the sale of the goods, and to do so the price must be reduced. In the second case, it is assumed that demand increases in its several grades. It will now be possible to sell the goods by serving only the higher areas of demand, and in so doing the price can be raised. Within narrow limits, therefore, the adjustment of demand and supply can so proceed that irregularities in either will reveal themselves in price changes. But it is clear that changes might be quite abnormal, that supply, for instance, might be so vastly increased that the goods would not be salable, while demand might so diminish that a like result would be reached.

The law of supply and demand is most simply stated for a given commodity in a given market as we have done, but no account of it would be complete without a reference to the reaction of demand upon supply. Whether by an increase of the supply of a particular class of goods the price would be permanently lowered would depend upon whether this increased supply became a permanent factor. If by the price reduction a lowering of profits is the result, we must expect a curtailment in the product. On the other hand, a permanent increase of demand which in the first instance led to an enhancement of price must in time lead to a prospect of profits which invites capital into that line of business, and hence an enhancement of the supply. In the case of freely reproducible goods we find this tendency at work to prevent abnormal changes in customary and usual price relations. If, on the other hand, the goods are not freely reproducible, we are apt to find the tendency of a diminishing supply to raise prices checked by the process of substitution, and hence a falling off in demand. Thus, in the United States the substitution of coal for wood as fuel, and iron and steel for wood in construction work, has checked the rise in price which might otherwise have been expected. There are certain goods however, like the autographs of distinguished men now dead, or paintings by the old masters, which seem to lie wholly outside the ordinary rules fixing prices, as they cannot be duplicated or their places filled by substitutes. But such illustrations serve only to make clear how wide is the application of the law to the great bulk of the world's daily exchanges. For a clear discussion of demand and supply, consult Cairnes, *Leading Principles of Political Economy* (London, 1884). See POLITICAL ECONOMY.

DEMAR'ATUS (Lat., from Gk. *Δημάρατος*). A Spartan king from about B.C. 510 to B.C. 491. By the machinations of his colleague, Cleomenes (q.v.), he was deposed. He subsequently repaired to the Persian Court, and accompanied Xerxes as a councilor on that monarch's expedition against Greece.

DEMARCATION (Fr. *démarcation*, from Lat. *de*, off, away, ML. *marca*, boundary, limit, mark), LINE OF. The historical and cartographical name given to an imaginary line running due north and south 100 leagues west of the Azores, established by a Papal bull of Alexander VI. on May 4, 1493, delimiting the spheres of Spanish and Portuguese possession in the New World. All new lands discovered east of this line were to belong to Portugal, and all to the west to Spain. Dissatisfaction with this arrangement on the part of Portugal led to the conclusion of the Convention of Tordesillas between Spain and Portugul, June 7, 1494, in which the line of demarcation was shifted 370 leagues west of the Cape Verde Islands, so that Brazil, as yet undiscovered, subsequently fell to the share of Portugal. As between the two Iberian powers, the terms of the convention were respected in fair measure, though disputes as to the exact determination of the line were frequent. The other nations of Europe, however, paid little regard to the Papal bull. Consult Harrisse, *Diplomatic History of America* (New York, 1898).

DEMARTEAU, de'mär'tō', GILLES (1722-76). A French engraver, born in Liège. He is one of the most eminent exponents of the style of engraving in imitation of crayon drawing. He brought that process to great perfection, but was not, as is frequently stated, the inventor of it. In 1769 he was elected a member of the Paris Academy. His work comprises about 739 plates, for the most part after French masters. Among the best are: "The Wounded Lycurgus," after Cochin; "Justice Protecting the Arts," after Cochin; "Entombment of Christ," after Stellaert; "The Education of Cupid," after Boucher; and some excellent portraits, especially that of the painter Charles Vanloo.

DEM'AVEND', MOUNT. An extinct volcano of Persia, in latitude 36° N. and longitude 52° E., about 50 miles northeast of Teheran (Map: Persia, D 3). It has an altitude of about 18,000 feet and forms the loftiest peak of the Elburz chain, which separates the low shores of the Caspian Sea from the high tableland of Persia. Although no longer subject to eruptions, Demavend bears traces of comparatively recent activity. Its summit is conical and the crater still intact. At its base hot springs give evidence of the continued existence of volcanic heat at no great distance beneath the surface. A great deposit of sulphur covers the summit of Demavend, and is brought down to the plains in bags as an article of commerce. The first European to make the ascent of Demavend was William T. Thomson, in 1837. Demavend towers high above the neighboring mountains, the adjacent summits not exceeding two-thirds of its elevation. At all times it has been a conspicuous object from the great trade route between India and the West, along the edge of the Persian tableland. Zohak, a personification of the bad principle, was supposed by the Persians to be buried under Demavend.

DEMBEA, dĕm'bê-ȧ *or* dĕm-bē'ȧ. See TZANA.

DEMBIN'SKI, dĕm-bĕn'skê, HENRYK (1791-1864). A Polish and Hungarian general, born near Cracow, in Poland. He entered the Polish Army in 1809, took part in the invasion of Russia by the French in 1812, and was made captain by Napoleon himself on the battlefield of Smolensk. He subsequently distinguished himself at Leipzig. After the fall of the Empire, he returned to his native country, and lived in comparative obscurity for some time. The Polish Revolution of 1830 called him again to arms. He obtained the command of a brigade of cavalry, and exhibited heroic courage at the battles of Kuslev and Ostrolenka. Afterwards he was engaged in the campaign in Lithuania, and returning to Warsaw, was made commander-in-chief of the national army, holding the post, however, only for three days. After the surrender of Warsaw to the Russians, Dembinski went to France. In 1833 he proceeded to Egypt, and entered the service of Mehemet Ali, but returned to Paris in 1835. Some months after the outbreak of the Hungarian insurrection Kossuth appointed him commander-in-chief of the main Hungarian army (February 5, 1849). He drew up a line of campaign, but could not obtain the concurrence of Görgei, whose tardy arrival caused the loss of the battle of Kápolna (February 26-27, 1849). Forced to retreat behind the Theiss, Dembinski resigned his command, but subsequently consented to act under Mészaros. He was appointed to the command of the Northern Hungarian Army and strongly urged the necessity of uniting the cause of Hungary with that of Poland, proposing to lead an army into Galicia; but his advice was not taken. After the resignation of Kossuth, and the capitulation signed by Görgei at Világos (August 13, 1849), Dembinski fled to Turkey. In 1850 he returned to France and commenced to write his *Mémoires* on the Hungarian war. He died in Paris in 1864. Consult Danzer, *Dembinski in Ungarn* (Vienna, 1873).

DEME, dēm (Gk. *δῆμος*, *dēmos*, district). One of the subdivisions of the ancient Attic tribes. The word originally meant *a country district*, and was applied to the rural communities, or to the people living in the country, in distinction from those living in the city. The *demes* existed from an early period, and, according to tradition, were made constituent parts of the Athenian territory by Theseus, but they do not become historically important until the time of Clisthenes (B.C. 508-507). When Clisthenes abolished, for all but religious purposes, the four old Attic tribes, and substituted in their stead ten new tribes, he first divided the people territorially into a hundred demes, and then formed his tribes by arbitrary groupings of these demes. The demes were thus the primitive political units of the State. The number of demes was subsequently increased; about B.C. 200 there were 174; the highest number known to have existed is 182. They were variously named, some with gentile or patronymic names, some from the trades carried on in them, some from plants that grew in the neighborhood, and so on. Each deme had its presiding officer (δήμαρχος, *dēmarchos*), its treasurer (ταμίας, *tamias*), its controller (ἀντιγραφεὺς, *antigrapheus*), and other officers, besides its assembly, which was convened by the demarch, and wherein was transacted the public business of the deme. There was also for each deme a register wherein were enrolled, for political and other purposes, all the members of that deme. Consult: Hermann, *Griechische Alterthümer* (Freiburg, 1882); Leake, *Demes of Attica* (London, 1820); Haussouillier, *La vie municipale en Attique* (Paris, 1883); Wachsmuth, *Stadt Athen*, vol. ii. (Leipzig, 1890).

DEMENTIA. See INSANITY.

DEMERARA, dĕm′ē-rä′rȧ. A river of British Guiana (q.v.), South America, rising in the mountains of the interior, flowing north almost parallel with the Essequibo, and emptying into the Atlantic at Georgetown (Map: Guiana, British, F 2). It is about 200 miles long, 1½ miles broad at its mouth, and navigable by ships of considerable burden for 75 miles. Its affluents are numerous, though small. At its entrance into the ocean it affords a spacious harbor, obstructed, however, by a bar.

DEMESNE, dē-mēn′, or **DEMAIN′** (OF. *demaine, domaine*, from Lat. *dominium*, right of power). In the feudal system of land tenure, the dominion over land. But the dominion connoted by the term was the actual dominion of the freehold tenant, and not the theoretical dominion of the King or the mesne lord. It did not signify lordship of land, but the rights and the authority of the immediate owner. Such a tenant was said to hold 'in his demesne' (*in dominio suo*). Blackstone distinguishes accurately between the allodial, or absolute, owner, outside the feudal system, who was described as holding the land 'in his demesne,' and the feudal tenant, whose dominion was qualified by adding the phrase 'as of fee,' indicating a real and yet subordinate dominion. But he was probably wrong in using the same term to describe the King's paramount lordship. The King, indeed, held lands in his demesne; there were and still are 'demesne lands' of the Crown, but they are the immediate property of the Crown, owned and controlled by it, and not lands held of the Crown by freehold tenants. See CROWN LANDS; FEUDALISM; TENURE.

Ancient demesne is a species of privileged copyhold tenure, surviving in a few ancient manors which formed part of the demesne lands of the Crown in the time of the Conqueror, and are so recorded in Domesday Book. These manors may now be in the hands of subjects. Tenure of ancient demesne is sometimes known as customary tenant-right, privileged villeinage, and villein socage. The abolition of the peculiar privileges which attended it, by statute in 1833, has assimilated it closely to ordinary socage tenure. Consult: Blackstone, *Commentaries on the Laws of England;* Vinogradoff, *Villeinage in England;* Pollock and Maitland, *History of English Law* (2d ed., Cambridge and Boston, 1899). See COPYHOLD; SOCAGE.

DEME′TER. See CERES.

DEME′TRIUS (Gk. Δημήτριος, *Dēmētrios*). A sculptor of Attica, who flourished in the early part of the fourth century B.C. He was especially celebrated for the realism of his portraits, and was even censured for his excessively close imitation of natural defects.

DEMETRIUS, called PHALEREUS (Gk. Δημήτριος Φαληρεύς, *Dēmētrios Phalēreus*) (c.354-284 B.C.). A Grecian orator and philosopher. He was born at Phalerum in Attica, and was a pupil of the philosopher Theophrastus. In B.C. 317 he was appointed governor of Athens by Cassander, and held that office for ten years. His administration was so successful that the Athenians erected to him, it is said, 360 statues. When Athens was taken by Demetrius Poliorcetes in B.C. 307, Demetrius Phalereus was obliged to flee, retiring first to Thebes, and then to the Court of Ptolemy Lagi at Alexandria. After Ptolemy's death he was banished from Alexandria, and withdrew to Upper Egypt, where he died about B C. 284. Demetrius wrote many historical and philosophical works, but only fragments of these remain. The rhetorical treatise *On Style* (Περὶ Ἑρμηνείας, *Peri Hermēneias*), ascribed to him, is probably a composition of a later date.

DEMETRIUS. (1) A young Athenian in love with Hermia in Shakespeare's *Midsummer Night's Dream.* (2) The son of Tamora, Queen of the Goths, in Shakespeare's *Titus Andronicus.* (3) A friend of Antony in Shakespeare's *Antony and Cleopatra.* (4) Celia's princely lover in Fletcher's *The Humorous Lieutenant.*

DEMETRIUS OF BYZANTIUM, bĭ-zăn′shĭ-ŭm. A Peripatetic philosopher. He is supposed to have been the man who tried to dissuade Cato from suicide. Part of his book *On Poets* is quoted by Athenæus, and some portions of his other writings have been found at Herculaneum.

DEMETRIUS OF SU′NIUM. A cynic philosopher. He was a disciple and afterwards an antagonist of Apollonius of Tyana. He lived in great simplicity at Rome in the period from about A.D. 40 to about 80, and enjoyed the friendship of Seneca, who observes that Nature made him to show mankind how an exalted genius may live uncorrupted by the vices of the world.

DEMETRIUS. The assumed name of four pretenders to the throne of Russia between the years 1603 and 1613. In 1584 Ivan the Terrible died, leaving two sons, Feodor and Demetrius, the former of whom ascended the throne, but proved a weak ruler, and fell completely under the control of his brother-in-law Boris Godunoff. The second son, Demetrius, was brought up at a distance from the Court, and when only nine or ten years old either accidentally killed himself or was put to death. In 1598 Feodor died also, and Boris ascended the throne, but his tyrannical measures rendered him very unpopular. In 1603 a rumor spread through Russia that Demetrius was not dead, but had appeared in Poland. The fact was that a person calling himself Demetrius, but who, it is said, was in reality a monk named Gregory Otrepieff, belonging to the Convent of Tehudov, had succeeded in persuading Prince Wisniewski in Lithuania, and afterwards Mniszek, Palatine of Sandomir, that he was the true son of Ivan. The latter introduced him to Sigismund III., King of Poland, who saw in him a useful instrument for introducing Polish influence into Russia, and so aided him in his designs against Boris. Toward the close of 1604 Demetrius, supported by a number of Polish nobles, invaded Russia, defeated Boris, who died in April, 1605, and entered Moscow in June, 1605, the people receiving him with great enthusiasm. He ruled for some months with vigor; but his manifest predilection for the Poles soon excited the Russians against him, and the arrival of his bride, Marina Mniszek, the daughter of the Palatine of Sandomir, with a Polish retinue on May 12, 1606, brought the discontent to a head. Sixteen days later an insurrection broke out in the capital, headed by Prince Vasili Shuiski. The pretender was slain, and a multitude of the Poles massacred. Vasili Shuiski now ascended the throne; but in 1607 an individual appeared, alleging that he was Demetrius and that another had been mistaken for him in the Moscow massacre. He found a considerable number of adherents, and Marina acknowledged him to be her husband. The Poles helped him and for some time it seemed likely that he would succeed; but at length he was put to death at Kaluga, in 1610. The third pretender gave himself out to be the son of the first. After a brief career he fell into the power of the Czar and was strangled. The fourth made the same pretensions, but, falling into the hands of the Cossacks, was carried to Moscow, where he was executed in 1613. Consult: Scipkin, "Wer war pseudo-Demetrius I.," *Archiv für Slavische Philologie*, vol. v. (Berlin, 1898, 1900); Munro, *The Rise of the Russian Empire* (London, 1900); Kostomaroff, *Les faux Dmitri* (Saint Petersburg, 1864); Merimée, *Les faux Demetrius* (Paris, 1858), English trans. by A. R. Scoble.

DEMETRIUS I. (Gk. *Δημήτριος, Dēmētrios*), Soter (c.187-150 B.C.). King of Syria from B.C. 162 to 150. He was the son of Seleucus IV. Philopator, and lived at Rome as a hostage during the reign of Antiochus Epiphanes, who had usurped the throne. He escaped from confinement in B.C. 163, overthrew Antiochus, and, with the aid of the Romans, established himself firmly in power. He carried on war against the Jews and the Cappadocians, and freed the Babylonians from the rule of the satrap Timarchus. He fell in battle against the usurper Alexander Balas.

DEMETRIUS I., called Poliorcetes (*Δημήτριος Πολιορκητής, Demētrios Poliorkētēs*, besieger of cities) (c.337-283 B.C.). A king of Macedonia. He was the son of Antigonus and Stratonice. At an early age he assisted his father in the wars with the generals of Alexander, was defeated by Ptolemy at Gaza in B.C. 312, but soon after retrieved his fortune by gaining a victory over Cilles in Syria. In B.C. 307 he freed Athens from the rule of Cassander, and was received in the city with divine honors. He later defeated Ptolemy in a naval battle at Cyprus, and in B.C. 305 laid siege to Rhodes, but was unable to take the city. Being afterwards (B.C. 301) defeated at Ipsus by Seleucus and Lysimachus, his Greek sway passed from him, but in B.C. 295 he recovered Ægina, Salamis, and Athens. In B.C. 294 he murdered Alexander, brother of Antipater, and seized the throne of Macedonia, but was afterwards expelled by Pyrrhus, and finally surrendered to Seleucus, whose prisoner he remained until the time of his death, in B.C. 283. Demetrius is famous for having conducted his sieges on a grand scale, with all the paraphernalia known to the military science of that age.

DEMETRIUS II. A king of Macedonia (c.239-229 B.C.). He was the son of Antigonus Gonatas and grandson of Demetrius Poliorcetes, and was engaged in continual warfare with the neighboring peoples and the Achæan and Ætolian Leagues.

DEMETRIUS II., Nicator (?-c. 125 B.C.). A king of Syria. He was the son of Demetrius Soter, and lived many years in exile, but with the assistance of Ptolemy Philometer, whose daughter he married, he secured the throne in B.C. 146. His vices and cruelty engendered a formidable revolt in Syria, and about B.C. 138, in an expedition against the Parthians, he was defeated and taken prisoner. After ten years of captivity he was restored to power (c.128 B.C.), but was vanquished by a pretender to his throne in a battle near Damascus. He fled to Tyre and there perished by assassination (c. 125 B.C.).

DEMETRIUS III., Eucerus, King of Syria from B.C. 94 to 88. He was the grandson of Demetrius Nicator, and ruled jointly with his brother Philip, but was dethroned by him and died a prisoner among the Parthians.

DEMETRIUS FAN′NIUS. A plagiarist in Jonson's *The Poetaster*, a caricature of Dekker, who replied in the *Satiro-Mastix*.

DEMETRIUS TRICLI′NUS (Lat., from Gk. *Δημήτριος Τρίκλινος, Dēmētrios Triklinos*). A Greek scholiast of the fifteenth century. In addition to his recension of the text of Sophocles, which served as the basis of several subsequent revisions, he composed scholia on the same poet, and on Hesiod, Pindar, and Aristophanes. His works on the metres (*Περὶ Μέτρων, Peri Metrōn*) and figures (*Περὶ Σχημάτων, Peri Schēmatōn*) of Sophocles are of slight value.

DEMETRIUS ZE′NUS (Lat., from Gk. *Δημήτριος Ζῆνος, Dēmētrios Zēnos*). A writer of Zacynthus, who lived in the sixteenth century. His works include a translation of the *Batrachomyomachia* (about 1530) into modern Greek in the *στίχοι πολιτικοί, stichoi politikoi*, or popular verses, and a poem in the same measure on Alexander the Great (printed at Venice, 1829). The former work has been edited by Müllach (Berlin, 1837), and has been printed, with a Latin translation, by M. Crusius, in Ilgen's edition of the *Homeric Hymns* (Halle, 1796).

DEMETZ, de-mâs′, Frédéric Auguste (1796-1873). A French prison reformer, born in Paris. He studied law, and was subsequently made a judge. In 1836 he was sent by the French Government to the United States for the purpose of studying American penitentiaries. The results of his investigations were published in 1839 under the title *Rapports à Monsieur le comte de Montalivet sur les pénitenciers des Etats-Unis*.

One of the conclusions of this report is that the penitentiaries of Pennsylvania, organized on the plan of isolating the young prisoners, were inefficient. Demetz's chief services, however, were in connection with a reformatory founded by him on an entirely novel plan at Mettray near Tours. Hundreds of young criminals were gathered by him into this reformatory at the expiration of their terms of imprisonment, and there they were given instruction and agricultural work which entitled them to moderate compensation. The results thus achieved led to the introduction of this system in several other European countries.

DEMI′, or **DEMY** (Fr. *demi*, Lat. *dimidius*, half). A term in heraldry. An animal is said to be demi when only the upper or fore half of it is represented. In inanimate objects, the dexter half per pale is usually intended, when it is said to be demi, though a *demi fleur-de-lis*, for example, may be a *fleur-de-lis* divided per fess.

DEMI-CANNON. A large gun used in the Sixteenth and Seventeenth centuries and perhaps later. It is said to have had a length of 12 to 14 feet, a diameter of bore of 6¾ inches, and to have fired a ball of 33 pounds weight; there is some doubt about this, as a solid spherical shot for a 6¾-inch gun ought to weigh over 40 pounds. The point-blank range was estimated at 162 paces and its range at 2000. See Guns, Naval.

DEMI-CULVERIN. A gun of about the same date as the demi-cannon (q.v.). It was about nine feet long, had a bore of about four inches, and threw a ball of nine pounds weight. Its point-blank range was about 174 paces and its range 1800. See Artillery; Ordnance.

DEMIDOFF, dyĕ-mē′dôf, Princes of San Donato. A noble and wealthy Russian family, the most distinguished members of which are: (1) Nikita Demidoff (c.1665-c.1720), the founder of the family, a runaway serf, who amassed an immense fortune as a manufacturer of arms. He established numerous forges and foundries in the Urals, and died after 1720. (2) Akinfi Demidoff (died c.1740), son of Nikita, brought over skilled German miners to examine the rich deposits of gold, silver, and copper in the river valleys of Siberia. The Government made him a Councilor of State. (3) Prokop (1710-1786), son of Akinfi, established a commercial school in Moscow in 1772. (4) Paul Demidoff (1738-1821), cousin of Prokop, traveler and scientist, gave a museum of natural history to the University of Moscow, and founded the Demidoff Museum of Yaroslav. (5) Nikolai, Count Demidoff (1773-1828), nephew of Paul, married the Countess Strogonoff, and became a Privy Councilor and Imperial Chamberlain. He distinguished himself in the war against the Turks. In 1812 he raised a regiment and fought at its head against Napoleon. (6) Anatole (1812-70), son of Nikolai, displayed great enthusiasm for letters and the sciences. His principal book, published in Paris in 1839, entitled *Travels in Southern Russia and Crimea*, is the record of a great scientific expedition undertaken at his expense. In 1841 he married Mathilde de Montfort, daughter of Jerome Bonaparte. The marriage was dissolved by mutual consent in 1846. Hospitals, schools, and museums all over Russia testify to the munificence of the Demidoffs.

DE MILLE, Henry Churchill (1850-93). An American playwright, one of the authors of *The Wife*, *Lord Chumley*, and other pieces. He was born in North Carolina and educated at Columbia College, from which he was graduated in 1875. In 1882 he became examiner of plays at the Madison Square Theatre, and later he was an actor under A. M. Palmer's management. His first play, *Delmar's Daughter*, was produced in 1883 without success. In 1884 he produced *The Main Line*, by himself and Charles Barnard. In collaboration with David Belasco he wrote *The Wife* (produced in 1887 at the Lyceum), which proved a great success, and in the following seasons they brought out *Lord Chumley; The Charity Ball;* and *Men and Women*. In 1891 he adapted from the German *The Lost Paradise*.

DE MILLE, James (1837-80). A Canadian author, born at Saint John, New Brunswick. He graduated at Brown University in 1854, was professor of classics in Acadia College (Wolfville, Nova Scotia) in 1860-65, and from 1865 until his death, occupied the chair of history and rhetoric in Dalhousie College (Halifax, Nova Scotia). His publications include: *Andy O'Hara* (1860); *The Soldier and the Spy* (1865); *The Dodge Club* (2 vols., 1866-69); *The American Baron* (1870); *The Living Link* (1874); and *A Castle in Spain* (1882-83).

DEMI-MONDE (Fr., half-world). The better class of courtesans in Paris and other cities. The term originated with Alexandre Dumas *fils*.

DEMING. A village and county-seat of Luna County, New Mexico, 87 miles northwest of El Paso, Texas, on the Southern Pacific, the Atchison, Topeka and Santa Fe and the El Paso and Southwestern railroads and on the Rio Mimbres River (Map: New Mexico, E 4). It is a health resort and has important commercial interests, being the trade centre of a cattle and wool growing and mining region. Settled about 1881, and incorporated in 1901, it is governed under a charter of the latter date by a mayor, elected for a term of three years, and a unicameral city council. Population, 1906 (local est.), 3000.

DEMISE (OF. fem. of *demis*, from Lat. *demittere*, to hand down). In the most general sense, a transfer or conveyance of an interest in land. Technically the term is employed in two distinct senses: First, to denote a lease or letting of land for a term of years; second, to describe the transmission of the royal authority, dignity, and estates from one sovereign to his successor. The phrase "demise of the crown" does not signify the death of the sovereign, but the transfer or devolution of the kingdom, whether that occurs as the result of the death or of the voluntary abdication of the sovereign. Probably, however, it would be restricted to the case of a normal transfer of the crown in the succession established by law, and not to a change in the succession by revolution or otherwise. However this may be, the phrase 'demise of the crown' is the legal expression of the notion involved in the popular phrase, 'The king never dies.' It indicates that the government does not come to a full stop on the death or abdication of its head, but that the royal authority is continuous and permanent, passing at once, without a break or jar, to him who is to exercise it next. This conception of the matter, so important to the welfare of the kingdom and the stability of the government, is comparatively modern, the effect of the death of the sovereign in England having formerly been to paralyze for the time being many of the functions of government, including the administration of justice. The King's Peace had to be proclaimed anew by each sovereign at his accession, and the administration of government newly constituted. All these inconveniences have been remedied by a series of statutes enacted since the accession of William and Mary, and the principle of the immediate demise of the crown, as above described, firmly established. See Anson, *Law and Custom of the Constitution* (2d ed.,.Oxford, 1896).

DEMI-SEMI-QUAVER. Half of a semiquaver, or the thirty-second part of a whole note. See MUSICAL NOTATION.

DEMIURGE (Lat. *demiurgus*, from Gk. δημιουργός, *dēmiourgos*, handicraftsman, from δήμιος, *dēmios*, of the people + ἔργειν, *ergein*, to work). The name given in the cosmogony of the Gnostics to the creator or former of the world of sense. He was variously conceived. In general, he was the archon or chief of the lowest order of the spirits or eons of the pleroma; mingling with chaos, he formed in it a corporeal animated world. He created man, but could impart to him only his own weak principle, the *psyche* or sensuous soul; therefore the highest, the really good God, added the divine rational soul, or *pneuma*. But the power of evil in the material body, and the hostile influence of the merely sensuous demiurge, prevented the development of that higher element. The demiurge, holding himself to be the highest God, could not bring his creatures to the knowledge of the true Godhead; as the Jehovah of the Jews he gave them the imperfect law of Moses, which promised merely a sensuous happiness, and even that not attainable; and against the spirits of the *hyle*, or world of matter, he sent only a psychical, and therefore powerless, Messiah, the man Jesus. See GNOSTICISM.

DEMMIN, dĕm'mên (formerly *Dymin*, *Demmyn*, *Dammyn*, *Timin*, from OChurch Slav. *dymŭ*, smoke, Lat. *fumus*, Skt. *dhūma*, vapor). A town of the Prussian Province of Pomerania, situated on the navigable Peene, 33 miles west-northwest of Stettin (Map: Prussia, E 2). Besides the town proper, Demmin comprises three suburbs. There are manufactures of machinery, woolens, hats, sugar, and leather. It has also distilleries and breweries, and a considerable trade in lumber and grain. Population, in 1900, 12,085; in 1905, 12,541. Demmin, which had its origin in a Slavic settlement, was known as early as the Ninth Century as a place of some commercial importance. In 1164 it was taken by Henry the Lion, and in 1238 it became a member of the Hanseatic League. By the Peace of Westphalia it passed to Sweden, and in 1720 it came into the possession of Prussia.

DEMMIN, AUGUST (1817-98). A German-French art critic, born in Berlin. He went to Paris at the age of seventeen to complete his education, and made his home there until 1872; but traveled extensively throughout Europe and in Asia, in pursuit of his studies, especially in the fields of ceramics and the science of arms. In 1873 he settled in Wiesbaden. The most important of his works is *Encyclopédie historique, archéologique, etc., des beaux-arts plastiques* (1872-80; 5 vols., with 6000 illustrations). He published further: *Guide de l'amateur de faïences et porcelaines* (1873); *Guide des amateurs d'armes et armures anciennes* (1869); *Keramikstudien* (1881-83); *Studien über die stofflich-bildenden Künste und Kunsthandwerke* (1887-93). He was a contributor to the *Histoire des peintres de toutes les écolcs*, edited by Charles Blanc, and also wrote a number of comedies, dramas, and novels.

DEMMLER, dĕm'lĕr, GEORG ADOLF (1804-86). A German architect and politician. He was born at Güstrow, Mecklenburg, studied at the university and at the Academy of Arts in Berlin, and in 1824 entered the Government service of his native State. Appointed Court architect in 1837, he designed the plans for and partly erected a number of prominent structures in Schwerin, such as the Grand Ducal Palace, the Court Theatre, and the Arsenal. Much interested in the welfare of the workmen, he introduced a system of paying their wages by which they were made to share directly in the profits of their labor, to the exclusion of the contractors. His political attitude during the period of 1848-50 led to his dismissal from the Government service in 1851, whereupon he traveled for several years in Europe, and, after his return to Schwerin in 1857, devoted himself more especially to the practical solution of social problems. He was one of the founders of the National Association (Nationalverein), in 1859, of the League for the Promotion of Peace and Liberty, and in 1868 joined the so-called German People's Party at Stuttgart. He was elected to the Reichstag in 1877, but after its dissolution in 1878 did not seek reëlection.

DEM'OCE'DES (Gk. Δημοκήδης, *Dēmokēdēs*). One of the most famous of the early Greek physicians. He was born at Crotona, in lower Italy, about the middle of the sixth century B.C. After living at Ægina, Athens, and Samos, he was taken prisoner by the Persians and carried to the Persian Court, where he rendered important medical assistance to Darius I. Though honored by the Persians, he was desirous of returning to his native city; and, through the favor of Queen Atossa, he secured his appointment to a secret mission which was sent to Greece. Escaping on this expedition, he returned to Crotona.

DEMOCHARES, dê-mŏk'á-rēz (Lat., from Gk. Δημοχάρης). An Athenian orator, a nephew of Demosthenes. He began his public career as leader of the anti-Macedonian party (B.C. 322), and, after the restoration of the democracy in Athens (B.C. 307), became head of the patriotic party. He was exiled about B.C. 295, but returned in 287 or 286, after which he acted as Minister of Finance. He died after B.C. 280. Demochares left orations and an elaborate history of his time, only fragments of which remain. Consult Droysen, *Zeitschrift für die Altertumswissenschaft* (Giessen, 1836).

DEM'OCLES (Lat., from Gk. Δημοκλῆς, *Dēmoklēs*). An Attic orator of the school of Theophrastus, a contemporary and opponent of Demosthenes. He is known best as the defender of the children of Lycurgus against the calumnies of Mœrocles and Menesæchmus. Though none of his works is extant, he probably left some written orations, since Dionysius of Halicarnassus ascribes to him an oration which had been attributed to Dinarchus. Dionysius and Suidas call him Democlides.

DEMOCRACY (Gk. δημοκρατία, *dēmokratia*, government of the people, from δῆμος, *dēmos*, people + κρατεῖν, *kratein*, to rule). A term of wide and variable signification, comprehending such diverse but related conceptions as: (1) a society based on equality; (2) a State in which the actual power of government is lodged in the mass of the people; and (3) a form of governmental organization in which the authority of the State is directly administered by the people or their chosen representatives. The term is also often employed indefinitely to describe all of these taken together—in which case it may be defined as a form of society in which the social organization, the energy of the State, and the powers of government are directed and controlled by the mass of the people; and sometimes more vaguely to characterize the tendency of the progressive nations during the last two hundred years toward the realization of such a social and political organization. It is in the first, or social sense, that the term democracy is most frequently employed by Continental and especially French writers, and in the third or governmental sense by the Greek philosophers, while among English and American political writers, from Bentham to Lecky and Woodrow Wilson, the tendency has been to limit its use to the actual exercise of political power by the people, and therefore as coëxtensive in meaning with popular government.

A democratic society is one in which privilege, whether based on birth, on wealth, or on public service, has been abolished, and a substantial equality of legal rights and obligations and of social and industrial opportunity established. The existence of a caste, whether hereditary or intellectual, or of social classes is incompatible with a democratic organization of society, which is likewise menaced by the growth of centralization of wealth on the one hand, and, on the other, by the existence of extreme poverty and the growth of dependent classes. It can therefore, under the present industrial system, be only imperfectly realized in a state of civilization, its best illustrations being found in primitive or simple communities, like certain of the Swiss cantons and the frontier settlements in the western portions of the United States and Canada. Democracy as a social principle rests upon the doctrine of the essential equality of all men and of their equal worthiness—a notion derived mediately from the Christian conception of the equality of all men before God, but owing its translation from religion to society and politics chiefly to the influence exercised by the writings of Jean-Jacques Rousseau. In the form which he gave to it, and in which it claims our allegiance, the doctrine and the practice of it are wholly modern. Certainly there was no social equality in the 'state of nature,' in which Rousseau imagined himself to have found it, and the so-called democracies of the ancient world were anything but democratic in sentiment or in social structure. The triumph of the principle in the modern world has been checked by the unexpected persistence of the military spirit and the revival of militarism in Europe during the latter half of the nineteenth century, and by the wonderful industrial expansion of the same period, with the consequent increase and unequal distribution of wealth, in both Europe and America.

A government democratic or popular in form is a republic—that is, a government in which the administration of the affairs of the State is committed to the people, to be exercised by them either directly in popular assemblies, like those of the Athenian democracy, or indirectly through representatives chosen by them, as in the republics of the modern world. Of this it may be observed, first, that the pure or direct form of democratic government, at which the criticisms of Greek political writers were directed, has never been completely realized, and cannot be completely realized in practice. Certain of the functions of government must always be delegated. If the legislative power be exercised by the whole body of citizens, and the judicial power by large bodies of citizens chosen by lot or acting in turn, the executive power must always in fact be committed for longer or shorter periods to chosen representatives of the popular will. In the second place, even in this limited form, the direct form of democratic government is possible only in small and compact States, like the smaller Swiss cantons and the city States of antiquity; and even in these it has usually been found to be operative only on the undemocratic principle of rigidly limiting the number of citizens entitled to participate in the government. The town-meeting plan of government cannot be extended to the great aggregates of people which constitute modern States. In the third place, it is to be observed that, though the democratic State tends to act through republican forms, a representative republic is not necessarily democratic either in spirit or in its actual operation. A government republican in form may, like that of France, be essentially bureaucratic in structure and effect; or be, like that of most of the Spanish-American States, a military tyranny; or be, like that of Mexico, a virtual despotism. No one of these can properly be termed a democracy, though that designation would not be denied to England, which is a monarchy in form, or to Canada, which is a subordinate part of an empire. It would seem, therefore, that the term democracy is not properly used to describe the external form of government, but rather a type of political society in which the essential power of the State is wielded by the mass of the people.

As thus understood, the true antithesis of democracy is not monarchy or oligarchy, but absolutism, i.e. dominion exercised over the mass of the people by an individual or a group of individuals, however constituted, not responsible to the people nor bound by law or custom to consult their wishes. Democracy, on the other hand, is popular government — government actually directed and controlled by the people, under whatever constitutional forms. The terms monarchy, oligarchy, and republic properly describe the form, and not the essential character of a government. A democracy may exist under both of these forms. A limited monarchy, like that of England, under which the power of the State is actually exercised by the people through their chosen representatives, may be more truly democratic than a republic, like the recent government of the Transvaal, in which the actual power is wielded by a financial or political oligarchy, or like the Athenian Republic, in which it is restricted to a small minority of the male inhabitants of the State.

Attention has been called to the fact that democracy as a social principle is of modern origin. This explains the curious differences between the ancient and the modern conceptions of political democracy. The Aristotelian notion of democracy as a community of free citizens ruling the State, not being based on any conception of the essential equality of all men, was not offended by the existence in the State of a numerous laboring class, servile or free, and of a large resident alien population, which together outnumbered the political citizens ten to one, and which were equally excluded from participation in the government. The modern idea of a political democracy, on the other hand, being derived from the social conception of the equal worth of all members of the State, is satisfied with nothing less than the substantial participation of the great body of the people in the affairs of the State. It rests upon the theory that the people, their happiness being the true end of government, are better judges of what will conduce to their happiness than is any individual or group of individuals likely to arise by any hereditary or self-selective process—a sound and salutary doctrine, which, however, in political experience runs too easily into the extreme form of the assertion that for public purposes one man's opinion is as good as that of any other man, and that all men are entitled to equal weight in political affairs.

It is to England more than to any other nation, even than the United States, that the modern world owes the realization of the democratic ideal in forms of political action. The two great revolutions—that which resulted in the creation of the Commonwealth, and that which finally expelled the Stuarts—were essentially popular in character. Though the Parliament was throughout that period, and until the reforms of 1832 and 1867, an aristocratic body, its responsiveness to public opinion and its steadfast resistance to royal pretensions made it the type of a popular representative assembly in Europe. Before the middle of the nineteenth century every considerable European State, with the exception of Russia and Turkey, had adopted a constitution limiting the power of the Crown, and vesting a considerable share of political power in the people, and in most of them a representative legislature of the parliamentary or British type was adopted. But nowhere on the Continent, excepting in Switzerland and in Norway and Sweden, has popular government reached a high degree of efficiency or attained any considerable measure of success. Even in England the complete triumph of the democratic principle has been delayed, both in politics and society, by the persistence of the aristocratic tradition, which still preserves a considerable number of legal rights and privileges to a social class based on birth and inherited wealth, and which gives that class a preponderating influence in the political organization of the State.

Democracy in the United States is historically the offspring of the democratic forces in English political institutions. The radical wing of English republicanism and Whiggery in the seventeenth and eighteenth centuries dominated the settlement of the English colonies in America and dictated their political development. The simplicity of colonial life and the absence of any considerable representative of the English aristocratic classes promoted the orderly growth of a homogeneous democracy, which stood clearly revealed when the shock of separation from the mother country came. The speedy adoption of a written constitution, however, fixed the forms of American democracy, and in so far tends to control the evolution of its ideals. The result is that in most forms of political action the United States is now less democratic than Great Britain. In spirit the English democracy is doubtless more conservative than that of the United States. See CONSTITUTION; GOVERNMENT; REPUBLIC.

Most of the philosophical authorities are hostile critics of democratic government. For the ancient and mediæval view, see Dunning, *History of Political Theories—Ancient and Mediæval* (New York, 1902); for the modern view, consult: De Tocqueville, *Democracy in America* (1835); Motley, *Historic Progress of American Democracy* (1869); Freeman, *Comparative Politics* (London, 1873); Maine, *Popular Government* (London, 1885); Bryce, *The American Commonwealth* (2d ed., London and New York, 1895); Lecky, *Democracy and Liberty* (London, 1896); Burgess, *Political Science and Constitutional Law* (Boston, 1891); Wilson, *The State: Elements of Historical and Practical Politics* (Boston, 1892); Ostrogorski, *Democracy and the Organization of Political Parties*, 2 vols. (New York, 1902)

DEMOC'RATES (Lat., from Gk. *Δημοκράτης*, *Dēmokratēs*). An Attic orator who lived about B.C. 350, a contemporary of Demosthenes and an opponent of the Macedonian party. He accompanied Demosthenes to Philip to receive the latter's oath to the treaty with Athens, and afterwards assisted him in concluding a treaty against Philip with the Thebans. As an orator he was of only secondary importance. A fragment of one of his orations is preserved in Aristotle (*Rhetoric*, iii. 4, 3).

DEMOCRATIC PARTY. The term Democratic, as used in American party politics, was occasionally and loosely applied in the years 1789-92 to the group of Anti-Federalists (q.v.), and thereafter, in the last decade of the eighteenth century and the first two decades of the nineteenth, to the party then commonly known as the Republican. The vigorous adoption by these Anti-Federalist Republicans, especially during Washington's Administration, of French principles and sympathies led to the application to them of the term Democratic Republican, which remained in quite common usage for more than thirty years. This general attitude was one of opposition to all centralizing tendencies in the interpretation of the Federal Constitution. They wished the National Government to remain weak, somewhat as it had been under the old Confederation; and they regarded the States as sovereign in an extreme sense of that word. (See STRICT CONSTRUCTIONISTS.) Upon the disappearance of the Federalist Party (q.v.), there gradually appeared within the only party then active two groups, one of which became known as the National Republicans, and the other of which retained the old name of Democratic Republicans. The former developed into the Whig Party (q.v.), while the latter was compactly organized as the Democratic Party, which has, since 1828, maintained an unbroken existence. This party, when thus organized by Jackson, adhered to the orthodox tenets of the old Anti-Federalists, the strict construction of the Constitution, and the limitation of the powers of the Federal Government. As slavery, however, soon became the most vital question in national politics, and as the Democratic Party was largely controlled by its Southern wing, it became finally the party of conservatism, in opposition to the new Republican Party's progressive platform of free men and free soil. The two sectional wings of this party became naturally separated during the course of the Civil War, and the subsequent process of rehabilitation was so prolonged that the party was not again able to elect a President (leaving out of account the disputed election of 1876) until 1884, when entirely new issues were involved. In its later course the party, in accordance with its old traditions, became particularly conspicuous as the advocate of tariff reform, and upon that platform its only post-bellum President, Grover Cleveland, was elected.

The founding of the present Democratic Party, although in large measure due to the bitter fight between the followers of John Quincy Adams and those of Andrew Jackson, occurred in a decade during which were effected certain significant changes in the American political system. Thus, the practice, which had been hitherto uniformly observed, of having the presidential electors chosen by the State Legislatures, was in some States abandoned, and thereafter the present method, by which the voters at large were given a share in the choice of the electors, was gradually introduced. Moreover, the old method of leaving the choice of presidential candidates to a caucus (q.v.) of the members of a party in Congress was vigorously attacked in 1824, with the result that after 1828 the people at large, through the medium of the national nominating conventions, had a direct share in the choice of candidates. Furthermore, in the same decade was felt for the first time the real significance of the political power of the new States beyond the Alleghanies; for, with the rise to power of the new Jacksonian Democracy, there was given full sway to the principles of equality and of thorough democracy, which were best illustrated in the region of which Jackson was the natural product. In large measure, the first conflict, in addition to being a largely personal one between the followers of Adams and those of Jackson, became a struggle between the old aristocracy of the East and the new democracy of the West, in which the latter, having almost won in the campaign of 1824, triumphed decisively in 1828, and brought to the Presidency the man who, in eight years, was to transform a personal following into a dominating national party. Jackson brought under his leadership not only the friends of Calhoun and of W. H. Crawford, but also the strong forces of the Albany Regency (q.v.), under the lead of his Secretary of State, Martin Van Buren. Accordingly, the Democratic convention—the first national convention of the party—which met at Baltimore, May 21, 1832, had little more to do than to name a candidate for the Vice Presidency, and in that step they followed the will of their leader and named Van Buren. This convention originated the so-called 'two-thirds rule.' The election which followed indicated clearly that Jackson's policy as to the tariff and as to the National Bank had been approved, inasmuch as he received 219 electoral votes, while Henry Clay received only 49, Jackson carrying besides the Southern States, excepting Kentucky, the States of Maine, New Jersey, New Hampshire, and New York. The next convention of the party, that at Baltimore on May 20, 1835, was peculiar in having some 626 delegates, of whom 422 came from four States, Maryland, for instance, sending as delegates every member of the State Democratic convention. As was commonly expected, Van Buren was given the nomination, Richard M. Johnson, of Kentucky, being named for the Vice-Presidency. The vote of the Whig candidate, William H. Harrison (q.v.), was increased to 73, while Van Buren's electoral vote fell to 170, a part of this Democratic weakening being accounted for by the 26 votes which were cast for Judge White, of Tennessee, and the 11 votes which were cast for Mangum by South Carolina. The whole responsibility for the failure of the financial policy of Jackson and Van Buren was placed upon the Democratic Party, with the result that in 1840 General Harrison received 234 electoral votes and Van Buren received only 60. The Democratic convention of May 4, 1840, had been especially uncertain in its action because of a pronounced difference of opinion as to the claims of Vice-President R. M. Johnson. The convention adopted, in a series of resolutions, what was substantially a 'platform,' expressing their view of the limited authority of the Central Government, and of the impropriety of Federal laws establishing a national bank, providing for internal improvements, or fostering particular industries. The same platform, with additions, was adopted by the convention held at Baltimore on May 27, 1844, which pronounced for the reoccupation of Oregon and the annexation of Texas. For the first time in a convention of the party, there was then a serious contest for the Presidential nomination. Upon the first ballot, Van Buren received a majority of the votes, and, although in the lead for four ballots, for the four subsequent ballots the leading candidate was General Cass, of Michigan; but on the ninth ballot the convention was 'stampeded' for an inconspicuous candidate, possibly advanced to preserve harmony, James K. Polk, of Tennessee. George M. Dallas, of Pennsylvania, was nominated for the Vice-Presidency, and this ticket received 170 electoral votes, as against 105 votes cast for Henry Clay. The failure of Van Buren to secure the party's nomination in 1844, and the choice by Polk of William L. Marcy (q.v.), of New York, as his Secretary of State, brought into prominence the factional controversy between the 'Barnburners' (q.v.) and the 'Hunkers' (q.v.), in New York. Both of these factions sent delegations to the convention of May 22, 1848, at Baltimore, and both delegations were admitted to seats, the vote of the State being divided equally between them. Neither delegation took thereafter any part in the convention, although the Hunkers and Marcy supported the Administration and the party's nominee. On the fourth ballot, General Lewis Cass, of Michigan, was nominated for the Presidency; and for the Vice-Presidency Gen. William O. Butler, of Kentucky, was named, the convention also readopting substantially the platform of 1844. The seceding 'Barnburners' held a State convention in June, in which delegates from four other States were present, and nominated Van Buren for the Presidency, and in August they took part in the national convention of the Free Soil Party at Buffalo, which nominated their leader for the Presidency, and Charles Francis Adams for the Vice-Presidency. This combination of 'Free-Soilers' and 'Barnburners' effected such a division of the Democratic vote in New York that Taylor carried the State and secured in the aggregate 163 electoral votes, while Cass received 127. Between 1848 and 1852, political conditions were materially changed, particularly through the progress of events attending the Compromise Measures of 1850 (q.v.), and also through the effect upon the Whig Party of the differences between the 'Conscience' Whigs and the 'Cotton' Whigs. At the Baltimore convention of June 1, 1852, Cass, Buchanan, and Douglas were prominent candidates, but on the forty-ninth ballot Franklin Pierce, of New Hampshire, was named, William R. King, of Alabama, being nominated for the Vice-Presidency. The platform was similar to that of 1848, with the addition of the 'finality' plank, with an approval of the doctrines of the Virginia and Kentucky Resolutions (q.v.), and with a declaration of the justness of the war against Mexico. The Free-Soilers nominated John P. Hale (q.v.), of New Hampshire, while the Whigs, for what was the last campaign of the party, nominated Gen. Winfield Scott (q.v.), who received only 42 electoral votes, as against 254 cast for Pierce. In the convention of June 2, 1856, Pierce was again a candidate, being supported largely by Southern delegates, while the Northern delegates supported James Buchanan, of Pennsylvania, who was chosen on the seventeenth ballot, John C. Breckenridge being named for the Vice-Presidency. The platform introduced a declaration in favor of insuring the ascendency of the United States in the Gulf of Mexico, and contained a declaration of the right of the Territorial governments of Kansas and Nebraska to allow slavery in those Territories. The convention of the American Party nominated ex-President Fillmore, who received the eight electoral votes of Maryland, and the new Republican Party (q.v.) nominated John C. Frémont (q.v.), who secured 114 electoral votes, while Buchanan was elected with 174 electoral votes. The year 1860 was disastrous to the organization of the Democratic Party, inasmuch as it had become impossible to hold all factions of the party to the support of any one platform. Thus, the convention of the party, which met at Charleston, S. C., April 23, adopted resolutions which represented the middle view as to slavery rather than the distinctively Southern view, and this led to the withdrawal from the convention of the solid delegations of Alabama, Mississippi, Florida, and Texas, as well as of many delegates from Georgia, Louisiana, South Carolina, North Carolina, Arkansas, and Delaware. The portion of the convention remaining in session adopted a resolution that a vote equal to two-thirds of a full convention should be necessary for a nomination, and after several days of ineffectual balloting, in which Stephen A. Douglas (q.v.) was easily in the lead, adjourned to meet at Baltimore on June 10. At that time the places of the Charleston seceders were filled so uniformly with followers of Douglas that a new secession took place, under the lead of some of the Virginia delegates, whose example was followed by most of the delegates from the other Southern States. Finally, the delegates still remaining virtually rescinded the two-thirds rule, and declared Douglas to be their nominee for the Presidency. Herschel V. Johnson, of Georgia, was nominated for the Vice-Presidency. The delegates who had withdrawn from the Baltimore convention, representing in some manner twenty-one States, proceeded to nominate for the Presidency John C. Breckenridge, of Kentucky, and for the Vice-Presidency Joseph Lane, of Oregon. These nominations, furthermore, were adopted by those who had seceded at Charleston, and had later met in convention at Richmond. In the following election the combined popular vote of Douglas and Breckenridge exceeded the popular vote of Lincoln by more than 350,000, although the electoral vote of Lincoln was 180, while that of Breckenridge was 72, and that of Douglas only 12. Douglas secured the whole electoral vote of Missouri, and three votes from New Jersey. The Constitutional Union Party (q.v.) carried Virginia, Kentucky, and Tennessee, and the rest of the South went solidly for Breckenridge. The strength of the Democratic Party was thus plainly in the South, and the effect of the war was naturally to remove the party, for the time being, from its position as a factor in national politics. Even in 1868 three Southern States were still in such relation to the National Government as to lose their electoral votes entirely. In the campaign of 1864 General McClellan (q.v.), standing as a candidate in the North on a platform which declared the war was a failure, secured only 21 electoral votes as against the 212 given to Lincoln. The party having taken an attitude of criticising both the conduct of the war and its results, its defeat was assured by the Republican nomination in 1868 of General Grant, who received 214 electoral votes, while his opponent, Horatio Seymour, received only 80, of which 33 were from his own State of New York. The intrenchment of the Republicans in power was emphasized in the following campaign, when Grant's vote rose to 286, while for his Democratic opponents (the regular Democratic candidate, Horace Greeley having died before the casting of the electoral votes) were cast only 63 votes. The character of the Republican administration, and the vigorous attacks upon it (see CRÉDIT MOBILIER), made possible the return to effective activity of the Democrats, particularly as they had an especially strong leader who as the reform Governor of New York, and as the successful opponent of Tweed (q.v.), had become the most conspicuous Democrat of his day. The energetic campaign of 1876, however, while seeming to give Tilden substantial success, resulted in the election of Hayes, through the intervention of the Electoral Commission (q.v.). In the matter of popular vote, the following election was equally favorable to the Democrats, the vote of Garfield exceeding that of Hancock by fewer than 1000. Garfield, however, received 214 electoral votes, while Hancock received only 155. In the ensuing campaign the Democrats were able to take advantage of the factional conditions within the Republican

Party, and this advantage was greatly increased, on the one hand, by the Republican nomination of James G. Blaine, and the immediate development of the so-called Mugwump opposition to him (see MUGWUMP), and, on the other hand, by the Democratic nomination of the reform Governor of New York, Grover Cleveland. A revolt against the alleged Republican corruption, and other unusual elements, combined to bring about, for the first time since the war, the election of a Democratic President; although in 1888 Cleveland himself was defeated by Benjamin Harrison, only to be even more strikingly successful in 1892, receiving 276 votes to the 145 given to Harrison. The plank of tariff reform had thus within a decade carried the party through two successful campaigns, but the greatly increased power of the protectionists (see TARIFF) made doubtful any further success in that line by the Democrats, while at the same time a faction in the party forced to the front a new issue, seemingly a sectional issue, and, having secured control of the convention of 1896, introduced the 'free silver' plank into the platform, and nominated William J. Bryan. In spite, however, of the aid given to the Democrats by the Populists (q.v.), the principles of the gold standard and a high tariff were indorsed in the election of William McKinley (q.v.). Four years later the Democratic Party once more nominated Mr. Bryan. President McKinley received 292 electoral votes as against 155 cast for Mr. Bryan. The defeat had the effect of lessening the influence within the party of the silver and Populistic faction, so that in 1904, the party's candidate was Alton B. Parker of New York, a conservative Democrat. He received 140 electoral votes as against 336 cast for Mr. Roosevelt.

Consult: Gillet, *Democracy in the United States* (New York, 1868); Van Buren, *Political Parties in the United States* (New York, 1867); Johnston, *American Politics* (last ed., New York, 1902); Ostrogorski, *Democracy and the Organization of Political Parties* (New York, 1902); Woodburn, *Political Parties and Party Problems in the United States* (New York, 1903).

DEMOC′RITUS (Gk. Δημόκριτος, *Dēmokritos*). An illustrious Greek philosopher, often popularly spoken of in both ancient and modern times as 'the Laughing Philosopher,' just as Heraclitus was styled 'the Weeping Philosopher.' He was born at Abdera, in Thrace, about B.C. 470 or 460. Of his life little is known. The statement that he was first inspired with a desire for philosophic knowledge by certain Magi and Chaldeans whom Xerxes had left at Abdera, on his Grecian expedition, is as untrustworthy as that which represents him as continually laughing at the follies of mankind. His extensive travels, however, through a great portion of the East, prove his zeal for knowledge, as does also his ceaseless industry in collecting the works of other philosophers. Democritus was by far the most learned thinker of his age. He had also a high reputation for moral worth, and appears to have left a strong impression of his disinterestedness, modesty, and simplicity on the mind of the community, for even Timon the Scoffer, who spared no one else, praised him. The period of his death is uncertain. He lived, however, to a great age. Only a few fragments of his numerous physical, mathematical, ethical, and grammatical works are extant. These have been collected by Mullach (Berlin, 1843). Consult also Ritter and Preller, *Historia Philosophiæ Græcæ* (7th ed., Gotha, 1888).

Democritus's system of philosophy is known as the Atomic System. Its essence consists in the attempt to explain the different phenomena of nature, not—like the earlier Ionic philosophers—by maintaining that the original characteristics of matter were qualitative, but that they were quantitative. He assumes, therefore, as the ultimate elementary ground of nature, an infinite multitude of indivisible corporeal particles, atoms (see ATOM), and attributes to these a primary motion derived from no higher principle. This motion brings the atoms into contact with each other, and from the multitudinous combinations that they form springs that vast and varying aggregate called Nature, which is presented to our eyes. Democritus did not acknowledge the presence of design in nature, but he admitted that of law. He believed strictly in secondary or physical causes, but not in a primary immaterial cause. Life, consciousness, thought were, according to him, derived from the finest atoms; those images of the sensuous phenomena surrounding us which we call mental representations were to him only material impressions, caused by the more delicate atoms streaming through the pores of our organs. Democritus boldly applied his theory to the gods themselves, whom he affirmed to be aggregates of atoms, only mightier and more powerful than men. The ethics of Democritus set happiness as the aim, and by this he understands serenity of mind, undisturbed by fear or passions; hence temperance, uprightness, and noble actions are to be cultivated. The physical philosophy of Democritus was made the base of the system of Epicurus, who reared upon it a structure of ethical doctrine. See EPICURUS; LUCRETIUS. Consult Zeller, *Philosophie der Griechen*, vol. i. (Leipzig, 1892).

DEMOD′OCUS (Gk. Δημόδοκος, *Dēmodokos*). The bard at the court of the Phæacian King Alcinous, who entertained Odysseus after his shipwreck. His songs are described in books vii. and viii. of the *Odyssey*.

DEMOGEOT, de-mṓ′zhṓ′, JACQUES CLAUDE (1808-94). A French author, born in Paris. He taught literature in the colleges at Beauvais, Rennes, and Lyons; became professor of rhetoric at the Lycée Saint Louis in Paris, in 1843; and finally was appointed to a chair in the Faculté des lettres at the Sorbonne. His most important work is the *Histoire de la littérature française depuis ses origines jusqu'à nos jours* (1851; 25th ed. 1895), held in great esteem in the literary world. He published further: *Etude sur Pline le jeune* (1845-50); *Les lettres et l'homme de lettres au XIXème siècle* (1856); *La critique et les critiques en France au XIXème siècle* (1857); *Tableau de la littérature française au XVIIème siècle* (1859); *Contes et causeries en vers* (1862); *Histoire des littératures étrangères considerées dans leurs rapports avec le développement de la littérature française* (1880).

DE′MOGOR′GON (Gk. δαιμών, *daimōn*, demon + γοργός, *gorgos*, horrible). A mysterious being whose name first appears in some manuscripts of the commentary of Lactantius (or Lutatius) Placidus to the Thebaïs of Statius (iv. 516) as the name of the mighty being whom all the powers of the lower world obey. Other manuscripts show varying forms, and it is very probable that we have to do with a copyist's corruption of the Greek δημιουργός, *dēmiourgos.* Mythological writers of the Renaissance, especially Boccaccio, took up the word as the name of a supreme power, and thence it passed into Ariosto and other poets. Among English writers Demogorgon is mentioned by Spenser and Milton, and in Shelley's *Prometheus Unbound* is introduced as the mighty power which overthrows Jove. Even if the form of the name is correct, there is no reason to suppose that name or being was known to any classical writer.

DEMOG'RAPHY (Fr. *démographie,* from Gk. δῆμος, *dēmos,* country, people + γράφειν, *graphein,* to write, describe). A branch of the science of statistics. In its narrower sense it deals exclusively with vital statistics, the statistics of population. In its broader sense it has been defined as "the science of statistics applied to questions concerning the social well-being of the people," and it has been considered as synonymous with statistics. The term was first used by Achille Guillard in his *Eléments de statistique humaine ou démographie comparée* (Paris, 1855), and since then it has been adopted in all countries, although it has not been accepted by all statisticians. Demographic statistics are so closely associated with anthropology that demography has been called a branch of anthropology. They are also of special importance for sociology.

Statistics of population are fundamental. In general they measure the growth and decay of population, the normal and abnormal conditions, the working of great social influences, and the pressure of anti-social forces in the community. In a more detailed form demographic data may include the following: (1) The composition of the population; the numbers, density, sex, age, parentage, defective classes, physical condition in relation to disease and epidemics, and manner of grouping from point of view of race, occupation, or civil position. (2) Changes in population, as expressed in births, marriages, and deaths. (3) Migrations and their effects, both individual and local, and their relation to economic conditions. (4) Morality, with statistics of crime, illegitimacy, and suicide. (5) Degrees of education. (6) Economic and social statistics, especially relating to insurance. In drawing conclusions from these statistics an important theoretical topic is their application to the doctrines of Malthus.

Demography is recognized as a cognate subject to hygiene, and since 1887 the International Congress of Hygiene and Demography has held annual meetings in the different European cities. Demographic material is found in all national bureau reports on population. In the United States the word is less widely used, and in its narrow sense. For instance, Prof. Mayo Smith divides population for the study of social organization into demographic, social, and ethnographic classes, and only includes in the first the individuals who are distinguished by differences in sex, age, conjugal condition, and physical health. The American Statistical Association also publishes much demographic material without so distinguishing it. Consult: Mayo-Smith, *Statistics and Sociology* (New York, 1895); Levasseur, "History of Demography," in *Report of International Congress of Hygiene and Demography,* vol. i. (Budapest, 1894). See STATISTICS.

DEMOISELLE, de-mwä'zĕl'. A fish of the family Pomacentridæ. These fishes are remarkable for their graceful form and brilliant colors, and abound in tropical seas, haunting the coral reefs and feeding upon corals and other small creatures, much after the manner of coral-fishes. A characteristically brilliant species is pictured on the Colored Plate of PHILIPPINE FISHES.

DE MOIVRE, de mwä'vr', ABRAHAM (1667-1754). A distinguished French mathematician. He was born at Vitry, Champagne, but spent the greater part of his life in England, whither he fled in 1688, with many others, after the revocation of the Edict of Nantes (1685). He supported himself by private tutoring and public lecturing, and, toward the end of his life, by solving problems in chance, play, and annuities. He was a fellow of the Royal Society of London and member of the Berlin and Paris academies. The *Philosophical Transactions* of London contain many of his contributions. He was so esteemed by the Royal Society that he was chosen to decide the famous contest between Newton and Leibnitz concerning the invention of the calculus. De Moivre's researches, with those of Lambert, created the part of trigonometry (q.v.), which deals with the imaginary quantities, and he contributed much to the advancement of the theory of numbers and of probability. Among his published works are: *Miscellanea Analytica de Seriebus et Quadraturis* (1730); *Doctrine of Chances* (1st ed. 1718; 2d ed. 1738); *Annuities upon Lives* (1725, and several subsequent editions). The well-known theorem which bears his name is connected with complex numbers (q.v.). It may be stated thus: $(\cos\phi + i\sin\phi)^n = \cos n\phi + i\sin n\phi$.

DEMOLITION (Fr. *démolition,* Lat. *demolitio,* from *demoliri,* to pull down, from *de,* down + *moliri,* to build). The scientific destruction of an enemy's works or property. In modern warfare the destruction of material is often deemed by military commanders to be essential to the success of their operations. The material which has been destroyed on various occasions has included every kind which may be of use to an army acting either on the offensive or defensive. In some cases, as in the famous raid through the Shenandoah Valley, Va., practically everything which it was thought might contribute to the success, directly or indirectly, of the Confederate Army was destroyed by General Sheridan with a view of rendering it impracticable for the Confederate Army to operate in the valley as it had been doing. At the other extreme lies the destruction of some single piece of material which acts as a barrier to the progress of an army. A typical instance of this kind was the destruction of a door during the recent hostilities in China. The progress of the Japanese troops was delayed at one of the gates, or doors, the approaches to which were well covered by the fire of the Chinese. A Japanese corporal undertook to effect the demolition of the gate by an explosion. After he had placed the charge, ignited a fuse, and withdrawn from its immediate vicinity, the flame was extinguished by the Chinese. This operation having been repeated several times, he finally drew his sword after lighting the fuse and stood over the explosive, permitting himself to be killed by the same explosion which broke in the gate.

The principal agents used in demolitions are fire, explosives, mines, and tools. Where time allows and the material to be destroyed is inflammable, as in the case of crops, frame buildings, wooden bridges, etc., it is burned. In other cases the demolition is effected by the use of explosives, assisted sometimes by the pick, axe, and other tools. The explosives ordinarily used are gunpowder and guncotton. The materials most frequently to be demolished are guns, railroads, including their bridges and tunnels, walls, doors, telegraph and telephone lines. A large gun is most readily destroyed by removing the breech-block and by exploding a charge on the chase or in the bore. Locomotives and other machinery can likewise quickly be disabled by removing or destroying some vital part. Railroads have been destroyed by overturning sections of the track, removing and burning the ties; the rails can be placed on the piles of burning ties, heated in the centre, and then bent and twisted. If simply bent, it is a comparatively simple matter to straighten them again. If, however, they are well twisted, the rails must be re-rolled before they can be used again.

Walls and doors, if there is not time for breaking them down with picks and crowbars, can be demolished by exploding charges against them. If gunpowder be used, it is necessary to tamp the charge. If guncotton, the tamping is not essential. The rules governing the amount of explosive to be used are only approximate and must be considered in connection with the class of material to be destroyed. In general the amount of explosive force varies with the square of the thickness of the wall or pier to be demolished; and directly, as its length. For example, a brick wall two feet thick requires about two pounds per running foot of guncotton, while one four feet thick will require about eight pounds per running foot. A steel rail can be cut by the explosion of three-fourths of a pound of guncotton against its web. The destruction of bridges requires judgment in the placing of the charge. In the wooden bridge the destruction can be accomplished by building a fire under one or more pieces, whose failure will cause the entire bridge to drop. Similarly, an iron or steel truss bridge may be destroyed by cutting simultaneously with explosives the lower chord of some tension member near the centre of the bridge. Arched masonry bridges and tunnels can best be destroyed by exploding the proper sized charge on the top side of the arch near the haunches. When impracticable to reach the top side of the arch, the destruction may be effected by propping a large charge against the crown of the arch.

Wire entanglements placed as obstacles to the advance of the troops may be rendered ineffective by cutting with wire nippers, axes, or other edged tools. Telegraph and telephone lines can be destroyed by cutting down and burning the poles; the wires should be removed and twisted or buried. The demolition of material which may subsequently be of service to the friendly army should only be undertaken with great caution. The denial of its use to the hostile army may frequently be accomplished in some other way; for example, a telegraph line may be temporarily disabled by removing some instruments or establishing faults in the line.

DEMON (Lat., from Gk. Δήμων). A Greek writer who lived about B.C. 280. He is the author of *Atthis* ('Ατθίς), a work on the history of Attica, and according to Schneidewin and Müller, wrote Περὶ παροιμιῶν, a work on proverbs; and Περὶ θυῶν, on sacrifices. The extant fragments of his writings are collected in Siebelis, *Phanodemus* (*Demonis, Clitodemi, et Istri*) *'Ατθίδων et Fragmenta* (1812); and in Müller, *Fragmenta Historicorum Græcorum*, vol. i. (Paris, 1868). He is considered only a secondary authority.

DEMON (Gk. δαίμων, *daimōn*, of uncertain etymology, often derived from δαιοῦσθαι, *daiousthai*, to divide; ultimately connected with διδόναι, *didonai*, Lat. *dare*, Skt. *dā*, to give, or from Gk. δαῆναι, *daēnai*, to know, Skt. *dasra*, wise, but best connected, perhaps, if for *δασιμων, *dasi-mōn*, with Lat. *lares*, tutelary deities, Skt. *das*, to perish). In popular usage, an evil spirit or fiend, but in allusions to the classics a tutelary deity or a godling. The development of the demon-concept is an interesting one. In Homeric usage the word denotes an indeterminate god, and often, by euphemism, a hostile divinity. In Hesiod, however, the souls of the departed are called demons, and Æschylus in the *Persians* makes Atossa apply the term to her deified husband, Darius. Herein seems to lie the original meaning of the word, especially if the etymological connection with the Latin *lar* is sound. Denoting at first the ghosts of the benignant dead who, when duly propitiated, confer boons on those who observe their cult, and later godlings of the dead and hence a vague deity in general, and even fate, the concept entered by the time of Socrates and Plato upon its meaning of guardian spirit. In this sense Socrates called his indwelling genius δαιμόνιον, and he fancied that it spoke within him to restrain him, but never to impel him. The sense of the word which is the most common one is a Judæo-Christian development. In the reaction of Christ's teachings against the Græco-Roman civilization which ruled Palestine at that period, the deities of the gentiles became the devils of the Judæa-Christian faith. In the New Testament, therefore, demon always has a bad sense. The spread of Christianity carried the use of the word with it, and demon thus became a synonym of devil, fiend, and maleficent spirit in general. See DEMONOLOGY.

DEMO′NAX (Lat., from Gk. Δημῶναξ). A Cynic philosopher of Athens, belonging to the second century of the Christian Era. His character has been extolled by Lucian, and he seems to have been a benignant sort of person, quite as much Socratic as Cynic. Consult: Fritzsche, *De Fragmentis Demonactis* (Rostock, 1866); and Bernays, *Lucian und die Kyniker* (Berlin, 1879).

DEMONETIZATION. See BIMETALLISM.

DEMONIAC (Lat. *dæmoniacus*, Gk. δαιμονικός, *daimonikos*, from δαίμων, *daimōn*, demon). A person supposed to be possessed by a demon. The idea of such a possession is as widespread as the belief in the existence of demons. There is evidence of it in the ancient civilizations of Egypt and Babylonia; it existed in Persia and Judea, Greece and Rome, in the most flourishing periods of their history; it held a large place in the life of the Christian nations until the end of the eighteenth century; it is cherished by the mass of the people in India and China, and is found among numerous savage tribes.

This conception has offered itself as the natural explanation of certain extraordinary and startling phenomena. The frenzy of the prophet and the dervish, the Pythoness and the Bacchant, the necromancer and the witch, could only be understood in the earlier time as the obsession of a spirit, the temporary possession of a human being by a ghost. A frequent occurrence of such an unusual phenomenon would naturally give rise to the belief in a permanent possession, an incarnation of a god, a transmigration of an eminent ancestral spirit into the body of a descendant. As the divine frenzy was frequently connected with hysteria and epilepsy and seemed akin to insanity, these pathological conditions were naturally ascribed to the same agencies. Physical disabilities of long duration and apparently incurable, such as deafness, dumbness, and blindness, would also be accounted for in the same way, and ultimately all bodily diseases. As in course of time the demons were differentiated as evil spirits in distinction from the good spirits, gods, angels, saints (see DEMON), persons possessed by them were thought to secure from such impure sources forbidden knowledge, heretical doctrines, unholy enthusiasm, suffering and misfortune, or a singular immunity from want and disease in exchange for everlasting perdition.

Although a belief in demoniacal possession must have grown up spontaneously among different peoples from the need of explaining such abnormal and striking phenomena found everywhere, historic contact no doubt hastened the process of development and gave shape to latent tendencies. The highly specialized demonology providing a spirit for each important organ of the body and for every familiar disease, which meets us at the very dawn of history in Egypt and Babylonia, has, directly or indirectly, influenced all nations of western Asia and Europe. Thus, in Iran, Zarathushtra, by reciting the prayer called Ahuna-vairya, "caused all demons to vanish in the ground who aforetime flew about the earth in human shape" (Yasna ix. 15). Already in Homer (*Od.* v. 396) a demon causes wasting sickness; insanity and epilepsy, as well as the divine frenzy of the Bacchantes, are ascribed to demons by later writers. But there is every reason to believe that the increasing emphasis on the wickedness of the demons was occasioned by conflict with Persia on the one hand and Egypt on the other. How strong the native conception was is seen from the fact that even the Neo-Pythagoreans and Neo-Platonists did not limit the term to an evil spirit, as was done in Persia and Judea. Possession by a spirit must have been a very familiar conception among the ancient Hebrews. Without it, necromancy and witchcraft could not have flourished, and prophethood would have been impossible. The high moral ideals of the prophets whose words have come down to us cannot obscure the fact that they both considered themselves possessed by a spirit, whose spokesman they became by virtue of this possession, and also regarded other prophets as possessed in a similar manner by other spirits. The immunity with which they could make personal attacks upon kings, magistrates, and priests was undoubtedly due, in no small measure, to the general fear of the spirit that possessed them. The capacity for prophetic visions or conditions seems to have been connected with a certain epileptic or cataleptic tendency. The prophet was looked upon as a madman; the insane man was possessed by a spirit. David was perfectly safe when feigning madness (I. Sam. xxi. 13); his lament over Saul shows that he did not associate with the King his deeds in moments of insanity (II. Sam. i. 17-27). In the same way the frenzy exhibited in battle was looked upon as possession. The spirit was said to clothe himself with a man. While we have no positive evidence that disease was explained by spirit possession, the prophetic character of the literary remains in part accounts for the silence. As leprosy and pestilence were considered as the result of blows inflicted by Jehovah or some other god, coming unawares and smiting, so other sicknesses may have been traced to purely external attacks of such spirits as the Seirim or the Shedim. The growth of monolatry and transcendental theism forced the transfer of certain functions of deity to intermediaries. Then it was that contact with Persian, Egyptian, and Græco-Macedonian thought helped to develop the idea of demoniac possession so manifest in the Synoptic Gospels and the Talmudic literature. It has been observed that in no Gospel are all diseases referred to demoniac possession, and that Mark confines possession to psychical maladies such as insanity and epilepsy, while Matthew and Luke add instances of purely bodily diseases. The selection of Mark may be connected with the great importance that his Gospel attaches to the superhuman insight possessed by the demons, and it can scarcely be asserted with safety that he drew a sharp distinction between psychical and physical disease, or that he differed from the other Synopists in regard to the cause of ordinary maladies. Some scholars have maintained that Jesus did not really believe in demoniac possession, but only accommodated himself to the current belief. This is a highly improbable view; and the discussion recorded in Matt. xii. 22 et seq., seems to be decisive against it. Here Jesus assumes that members of the Pharisaic party are able to cast out demons, but points to his own extraordinary success as a sign that the kingdom of heaven is coming, and attributes his own work to a spirit working through him that must not be blasphemed. That exorcists formed a recognized profession among the Jews of the period may also be inferred from Talmudic literature, in which demoniacal possession and the possibility of expelling the demons are in numerous places accepted as facts.

Among the Celtic, Germanic, and Slavic nations there were many higher or lower nature-spirits to whose influence various distempers were attributed, and, though it cannot be definitely proved, there is reason to suppose that possession was not unfamiliar to them. But their conversion to Christianity made them at once acquainted with New Testament demonology and with an ecclesiastical organization that recognized exorcists as a clerical order. (See EXORCIST.) Persons who contrived to worship in secret the ancestral gods, even after they had been officially declared to be demons by the Church, were regarded as possessed. This would be especially the case with old women who adhered most persistently to the ancient cults.

Since obstinate clinging to wrong beliefs could only be accounted for by demoniac influence, heretics were also regarded as bewitched. In its battle with the demons, the Church never struck a heavier blow than when Innocent VIII. (q.v.), on December 5, 1484, sent out his bull *Ad futuram rei memoriam*. The methods of carrying out its recommendations were set forth, with brutal frankness, in the *Malleus Maleficarum*, written by his chief inquisitor, Jacob Sprenger. It has been estimated that a vast number of lives were destroyed as a result of these methods of dealing with demoniacal possession. As Luther and other leading reformers continued to cherish the belief, it maintained its hold upon the Protestant churches, and was responsible for much persecution, until, undermined by the attacks of deists and rationalists, it gradually disappeared before the progress of modern science. Consult: Semfer, *De Demoniacis* (Halle, 1760); Stübe, *Jüdisch-babylonische Zaubertexte* (Halle, 1895); Nevins, *Demon Possession* (Chicago, 1895); Maspero, *Dawn of Civilization* (Eng. trans. New York, 1894); Alexander, *Demonaic Possession in the New Testament* (Edinburgh, 1901); Townsend, *Satan and Demons* (Cincinnati, 1902).

DEMONOLOGY. The branch of comparative religion which concerns itself with beliefs regarding evil spirits or demons. The worship of demons is one of the most widespread of all religious phenomena. It may even be considered one of the chief sources of primitive religion. Beside the beneficent godlings or ghosts there exists a far greater number of maleficent beings who are either divinities or supernaturalized spirits. While the beneficent deities may, and often do, receive expressions of gratitude for past bounties and prayers for continued blessings in the future from their worshipers, it is the demon or maleficent godling or ghost who receives the greater amount of human tribute. The reason for this religious attitude in primitive society is not far to seek. The beneficent deity is, in the eyes of early man, an easy-going being who dispenses blessings as a matter of course, and he may therefore be trusted to continue on in his routine goodness. An occasional sacrifice as a token of gratitude or as an inducement to confer greater boons, or to recommence an interrupted course of beneficence, is quite sufficient for him. His blessings may even be overlooked in view of their quiet and orderly action, or be forgotten altogether on account of the number of painful events which befall man. With the demon things are altogether different. His power, which he constantly exerts for harmful ends, must be met with continued propitiation, in the shape of prayer or sacrifice. Furthermore, the malignancy of the demon cannot be overlooked, and is far more prominent to the primitive mind than beneficence, which, as already suggested, frequently passes unnoticed. The worship of demons is in general directly proportionate to the lowness of cult. As religion develops in any community or tribe, the demon's scope of malignancy is circumscribed accordingly, while the degree of worship paid to beneficent ghosts and godlings constantly increases.

Demons comprise several classes and occur in a vast variety of forms. The two main divisions are, as in the case of beneficent divinities, either superhuman, being personifications of the powers of Nature, or what may be termed posthuman, being ghosts of dead ancestors, especially of the chiefs, or of men who had been otherwise conspicuous in the community during life. These two classes of superhuman and posthuman godlings and demons frequently overlap, and the dividing line between them must be regarded as a shifting boundary. Here in many cases syncretism, or the blending of divinities originally distinct into one, may be the source of confusion. In such a divinity as the Greek Apollo, for instance, might be syncretized a beneficent godling of light, a ghost of some early member of a tribe conspicuous for musical ability, and the maleficent godling of light, who causes death and damage as in sunstroke. It is, in consequence, sometimes hard to tell to which division a given godling or demon belongs. Such an uncertainty is not in itself a proof of error of method. It is probably incorrect to assume an excessively nice discrimination in this regard among primitive mankind, although there is a marked tendency to elevate posthuman into superhuman divinities either beneficent or maleficent, while the change of nature deities into ghosts is practically unknown. On the other hand, the attempt to reduce all godlings and demons to the single category either of nature deities or of ghosts seems an unscientific one in its fundamental principle. There may even be other factors in the origin of belief in divinities, and it is an error to assume that the primitive is necessarily simple. Furthermore, the functions of the beneficent and maleficent deities, like the classification of superhuman and posthuman, are frequently fused. Thus the fire-godling may be beneficent, as in the hearth-fire, or maleficent, as in the conflagration of a village. Again, a malignant deity may, by proper sacrifices and ritual, become benignant to an individual or tribe, as in an invocation to smallpox to befall one's enemies.

The Semites furnish an admirable example of the course of development of demonology. In the earliest records of Babylonia and Assyria the antithesis between beneficent and maleficent deities is clearly marked. The conflict in the Babylonian creation myth of Marduk, the god of light, with Tiamat, the demon of darkness, a conflict which is indicated by Gen. i. 2-8, and more clearly in Rev. xii. 7-9, is an instance of enmity between two nature godlings. On the other hand, Lilith, according to Talmudic tradition, seems to have been originally a malignant ghost changed into a vampire or ghoul. The inference that ghosts were sometimes metamorphosed into demons seems justified from the account of the beneficent ghost of Samuel in the story of Saul and the witch of Endor, I. Sam. xxviii. 7-20. The Old Testament contains allusions to demons, such as the 'familiar spirits' of Lev. xx. 6, 27, the 'devils' of Lev. xvii. 7, Deut. xxxii. 17, II. Chron. xi. 15, Psa. cvi. 37, the creatures that haunt the desert, Isa. xiii. 21, 22; xxxiv. 14, 15, as well as the 'terror by night' and the 'pestilence' of Psa. xci. 5-6. On the other hand, the strongly Yahwistic tendency of the Old Testament was most unfavorable to any development of demonology in the Bible. Even the one demon who retained any real personality, Satan (see Devil), plays but a small part in the Old Testament. He is a servant (even, in Job. i. 6, ii. 11, reckoned among the sons) of Yahweh, and completely under his control, so that he is sharply rebuked by Yahweh in Zech. iii. 1-2, and is obliged to ask Yahweh's permission to tempt Job, in Job i. 6-12, ii. 1-7. That Jewish demonology was far more developed than the extreme Yahwism of the Old Testament would lead one to suppose is clear for several reasons. In the New Testament the power of demons is frequently mentioned. Insanity and disease are laid to demoniacal possession, and Christ is tempted by Satan, who is represented as an independent agent of the utmost enmity to God. The existence of storm demons is distinctly implied in the account of the stilling of the tempest in Matt. viii. 26-27, Mark iv. 39, 41, and Christ is mistaken for a spirit, either a storm demon or a malignant ghost, in Matt. xiv. 26. The Talmudic demonology, like the devil-lore of other Semites, as shown by the Koran and the vast Arabic literature, of which the *Arabian Nights* furnishes a familiar example with its tales of the jinns, who are probably ghosts of benignant, or more frequently of malignant, dead, is another proof. Most conclusive of all, perhaps, is the rich demonology of modern Semitic peoples, with its superhuman and posthuman fiends.

In India the development of demonology is still more instructive. Beside the primitive nature gods there existed nature demons no less ancient. Indra, the storm god, cleaves the dragon Ahi, who has confined the cows representing the rain-clouds. Here, too, can be seen the process of syncretism more clearly than in any other religious system. For instance, Indra is the god of the monsoons, and is beneficent, while the fearful Rudra typifies the ruin caused by the storm. Yet the benignant Indra and the malignant Rudra become blended into one deity, Indra, who is almost altogether beneficent. While nature demons are ancient, new ghost demons may be, and are, created constantly. There is an instructive story current in India of an irascible Englishman much dreaded by the natives. After his death his tomb was regularly visited and propitiatory offerings of brandy and cigars were presented to appease his ghost. On the other hand, the ghost of Rama Krishna, a Hindu ascetic of recent date, has become a beneficent godling about whom the logopoetic tendency universal in religion has already created numerous myths.

Beside the superhuman and posthuman gods and demons there is a third class of much later origin. These are abstract deities. They occur in nearly all the great religions, as in India, Greece, and especially in Rome. Thus in India by the time of the later Rig Vedic period, approximately probably about B.C. 500, Brahma the creator is practically an abstract deity. This is true in greater measure of such deities as Aditi (Boundlessness) and Ka (Who?). Persia had a large number of abstract demons, as Tarōmaiti (Pride), Akoman (Evil Mind), Duzhyairya (Drought), and the like. In Greece and Rome it will be sufficient to refer to the long list of abstract demons enumerated by Vergil, *Æneid*, vi. 273-281. It is obvious that the abstract gods and demons are more closely allied to the nature divinities than to ghosts.

Demonology is everywhere closely associated with witchcraft. In this two distinct processes are involved. In the first place, the demon must be placed under the control of the wizard, or, more commonly, of the witch. In the second place, the demon so controlled may become either non-injurious or malignant to some other person or persons. Control over the demons is gained in many ways. Thus a beneficent deity or something belonging to him may confer the power over demons. Familiar examples are the magic ring given by Allah to Solomon in the *Arabian Nights*, which enables him to control all jinns, and the tetragrammaton, or mystic letters YHVH of the name Jehovah (q.v.), during the Middle Ages. Demons may be exorcised or may be invoked against enemies by an equal variety of methods. Possession of some object belonging to the person to be affected is one of the most common modes. For this reason many tribes have careful regulations, as the ancient Persians, who disposed of parings of nails and clippings of hair according to prescribed form. An extremely widespread superstition of this class is the so-called power of the name. According to this the knowledge of the real name of the individual gives all who possess it control over him, and this may be used for demoniacal purposes. For this reason it is customary in many tribes, as among the North American Indians, to have secret names which are considered the real ones. The same view was held by the Jews, as is clear from Rev. ii. 17, xix. 12, Matt. vii. 22. Akin to this acquisition of demoniacal control is the selling of one's soul to the devil to gain some object, as in the famous Faust legend, or in the devotion of the Hindu Thugs to the malignant Kali, the wife of Shiva in his destructive aspect.

As has been suggested above, sacrifice is an important element of demonology. Since this class of offerings must be in general propitiatory, they are usually, in conformity to the nature of the demon, of a bloody or revolting character. Thus among the Aztecs the war-god, Huitzilopochtli, was honored by human sacrifices, the pulsating heart being the offering specially dear to him. The 'customs' of Ashanti, with their enormous waste of life, and their cruelty to men and animals, were primarily based on the necessity of appeasing malignant godlings. Even among the early Greeks a sacrifice of maidens was given each year to the Minotaur, and in early Rome the Tiber received an annual tribute of aged men. As civilization develops, the sacrifice becomes more and more ritualistic, and substitutes for the bloody offering may be made, as when, instead of sacrificing old men, dolls were thrown into the Tiber.

The change of gods into demons occurs frequently. When one tribe conquered another, it was customary for the pantheon of the defeated people to be incorporated into that of the conquerors. When, however, a nation has reached a monotheistic stage, or is inspired for any other reason by an intense hatred for the religion of the conquered, the gods of the subjected tribe may become demons. This is especially characteristic of later Judaism and Christianity and of Zoroastrianism. Thus in Ezek. viii. 13-18, among the greatest abominations are classed the annual mourning for Tammuz, an ancient Semitic spring godling, familiar to us from the Greek version of the myth in the story of Venus and Adonis, and the worship of the sun, which is most probably an allusion to Zoroastrianism. In this latter religion the gods of India (Skt. *dēva*) are demons (Av. *daēva*), and great Indra seems to have been turned into a fiend Andra by the Iranians. In like manner Ceylonese Buddhism sees demons in the old Brahmanic gods, and the jinns of Mohammedanism are the heathen Arabic deities in disguise.

The worship of demons has led to the cult termed diabolism or satanism (q.v.). The earliest mention of such a belief is in the Avesta (q.v.), where adherents of non-Zoroastrian faiths are called daevayasnians or demon-worshipers. Persia still has a numerous sect of devil-worshipers, called Yezidis (q.v.), who endeavor to keep on good terms with the devil that he may not injure them in the future world. A similar tendency existed to a marked degree in early Christian Gnosticism (q.v.). The sect of the Ophites, for instance, regarded Yahweh as an evil divinity, but the serpent, because of his promise of knowledge (Gen. iii. 5), as the highest god and a benefactor of mankind. The modern cult of satanism seems to be a survival of early Gnosticism. This worship, which is, for obvious reasons, of an occult nature, seems to unite to diabolism the widespread notions of phallicism, or worship of the reproductive powers of nature. Satanism, which is now mainly a travesty of Christianity, finds its culmination in the so-called black mass, where the Christian ritual is parodied in most revolting ways.

Consult: Collin de Planey, *Dictionnaire infernal* (Paris, 1844); Lecanu, *Histoire de Satan, sa chute, son culte, ses manifestations, ses œuvres* (Paris, 1861); Hild, *Etude sur les démons* (Paris, 1881); Laengin, *Wunder und Dämonenglaube der Gegenwart* (Leipzig, 1887); Conway, *Demonology and Devil-Lore* (2 vols., New York, 1889); Bois, *Satanisme et la magie* (Paris, 1895); Carus, *History of the Devil and the Idea of Evil from the Earliest Times to the Present Day* (Chicago, 1900); Jaulmes, *Essai sur le satanisme et la superstition au moyen âge* (Montauban, 1900); Alexander, *Demonaic Possession in the Old Testament* (Edinburgh, 1902); Thompson, trans., *The Devils and Evil Spirits of Babylonia*, 2 vols. (London, 1903-4); and see Angel; Devil; Sophiology; Superstition.

DEMONSTRATION, Military. An operation designed to deceive an enemy, persuading him that danger is threatening from another quarter, and inducing him to divide his force so as to meet the apparent as well as real danger. A demonstration made during the attack, in order to cover the development of the real point of attack, or to discover a vulnerable point in the defense, is called a feint.

DEMONSTRATIVE LEGACY. See Legacy.

DE MOR′GAN, Augustus (1806-71). An English mathematician, born at Madura, Madras. He was educated at Trinity College, Cambridge; was graduated as fourth wrangler (1827), and was professor of mathematics in the University of London (afterwards University College) from 1828 to 1831 and from 1836 to 1866. Besides being a mathematician of high rank, he was extensively versed in the history of mathematical and physical science. He gave much time in attempting to formulate Aristotelian logic into a symbolic system; contributed to the methods of calculating insurances and to the encouragement of a decimal coinage. De Morgan was the first president of the London Mathematical Society, and was a member of the Royal Astronomical Society. He was a remarkable teacher and suggestive writer, and his *Essay on Probabilities* (1838) is still one of the best in English. He died in London. The following are among his chief works: *Elements of Arithmetic* (1831); *Elements of Algebra, Preliminary to the Differential Calculus* (1835); *Essay on Probabilities, and on Their Application to Life Contingencies and Insurance Offices* (1838); *Trigonometry and Double Algebra* (1849); *Formal Logic, or the Calculus of Inference Necessary and Probable* (1847); *Arithmetical Books* (1847); *Treatises on the Differential and Integral Calculus* (1842), published by the Society for the Diffusion of Useful Knowledge; contributions to the *Penny Cyclopædia* and to the *Encyclopædia Metropolitana*. A memoir of De Morgan by his widow was published in London in 1882.

DE′MOS (Gk. δῆμος, *dēmos*, people). A word used in Greek to denote both the body of Athenian citizens and a township. A statue of the Demos (the people) by Lyson stood in the Senate House at Athens. See Deme.

DEMOS′THENES (Gk. Δημοσθένης) (c.383-322 B.C.). The greatest orator of the ancient world. He was born in the deme Pæania, in Attica. His father, a wealthy manufacturer, died early, leaving his fortune and children to the care of three guardians, who abused their trust. As soon as Demosthenes came of age he prosecuted at law these trustees and gained his case; but much of the property had already been squandered, and he recovered only enough to save him from poverty. His success in this and some other civil causes fixed his resolution to devote himself to public life, and he set himself to master the law and politics of his country with a labor and perseverance almost without parallel. His first appearance before the people was a failure, but this spurred him to overcome his defects. His first care was to conquer the physical disadvantages under which he labored. His health was naturally feeble, his voice harsh and tuneless, and his action ungraceful. We are told that, to strengthen his lungs, he used to climb steep hills, reciting as he went, or declaim on the shores of the sea in stormy weather. To improve his delivery, he took instructions from Satyrus, the actor, and did not disdain to study effects before a mirror. His feebleness of health he never fairly overcame; but he obviated the defects of his early training by the severest study pursued for months at a time without an interruption.

Demosthenes first began to take part in public affairs when he was about twenty-five years of age, and from that time till his death his history is the history of Athens. The States of Greece were at this time miserably weak and divided, and had recklessly shut their eyes to the dangerous encroachments which Philip of Macedon was already making on their common liberties. The first period of Demosthenes's public life was spent in warning his countrymen to abate their mutual jealousies, and unite their forces against the common enemy, whose crafty and grasping policy he exposed, about B.C. 351, in the oration known as the *First Philippic*. In B.C. 347 Philip became master of Olynthus, the last outpost of Athenian power in the north, which, in a series of splendid harangues—the three *Olynthiacs*—Demosthenes had implored his countrymen to defend. Peace was now necessary for Athens, and Demosthenes was among the ambassadors sent to negotiate with the conqueror; but Macedonian gold had done its work, and Demosthenes, as incorruptible as he was eloquent, saw with despair that Philip was allowed to seize Thermopylæ, the key of Greece, and become a member of the Amphictyonic League. The peace, concluded in B.C. 346, lasted for six years, during which Philip's incessant intrigues were exposed and denounced by Demosthenes in orations hardly less remarkable for their political wisdom than for their eloquence. The most important of these were the second and third *Philippics*, and the speeches on *The False Embassy* and *The Affairs of the Chersonese.* When Philip entered upon a fresh course of aggression (B.C. 340), and laid siege to Byzantium, he was baffled for a time through the assistance afforded by the Athenians to the besieged city at the instance of Demosthenes (B.C. 339). In B.C. 338, when Philip threw Athens into consternation by passing Thermopylæ and seizing Elatea, Demosthenes brought about an alliance between his countrymen and Thebes. But the Macedonian phalanx proved invincible, and the battle of Chæronea laid Greece prostrate at the feet of the King. Demosthenes pronounced the funeral oration over those who fell in the battle, and urged the Athenians to repair their walls against their enemy, contributing to the expense from his own purse. For these services Ctesiphon proposed that he be given a golden crown; whereupon Æschines, Demosthenes's lifelong opponent, attacked Ctesiphon with the charge of having made an illegal proposal. Demosthenes defended him (B.C. 330) in his oration *On the Crown*—essentially a review of his entire political career—which the almost unanimous verdict of critics has pronounced to be the most perfect masterpiece of oratory of ancient or modern times. Æschines was defeated and obliged to leave Athens, and spent the remainder of his life in exile. In B.C. 324 the enemies of Demosthenes brought about his conviction on a charge of having received bribes from Harpalus, the absconding treasurer of Alexander. Unable to pay the fine imposed, he was thrown into prison, but succeeded in escaping. The death of Alexander the Great in the following year was followed by the triumphant return of the orator, and he was again at the head of affairs. But the disastrous issue of the Lamian War, waged by the Greeks against Antipater, was fatal to Demosthenes. Once more the power of Macedon prevailed. The surrender of Demosthenes was demanded by the conquerors. Finding escape impossible, the orator sought an asylum in the temple of Poseidon, in the island of Calaurea. Before his pursuers overtook him he died (B.C. 322), as was generally believed, of poison administered by his own hand.

The personal character of Demosthenes is one of the noblest. His bravery, the stainless purity of his public and private life, his splendid and disinterested, if blind, patriotism, and his services as a statesman and administrator, entitle him to a place among the noblest men of antiquity. As an orator he has been assigned the highest place by all critics since his own day.

There have come down to us sixty speeches, six letters, a letter from Philip of Macedon, and a collection of introductions (*προίμια*). All the letters, introductions, and some of the speeches are regarded as spurious. The works are best edited by Bekker (1824), Sauppe (1843), and by Dindorf-Blass (4th ed., 1889-92). Of the single speeches there are many special editions; of the oration *On the Crown* the best in English is by Goodwin (1901). There is a translation of the orations by Kennedy, in five volumes (London, 1853-63). On the life and art of Demosthenes, consult: Schäfer, *Demosthenes und seine Zeit* (Leipzig, 1885-87); Blass, *Attische Beredsamkeit*, vol. iii. (Leipzig, 1893).

DEMOSTHENES (?-B.C. 413). A conspicuous Athenian general in the Peloponnesian War. He was one of the commanders sent (B.C. 413) to reinforce Nicias at Syracuse, but he was captured and put to death.

DEMOTIC ALPHABET. See EGYPT.

DEMOT'IKA (MGk. *Διδυμότειχον*, *Didymoteichon*, double-walled, from *δίδυμος*, *didymos*, twin, + *τεῖχος*, *teichos*, wall). A town in European Turkey, in the Province of Adrianople, 22 miles south of Adrianople (Map: Turkey in Europe, F 4). It is situated on the Maritza, here navigable for small vessels, and is connected by rail with Constantinople. It contains an old palace and a citadel, and is the seat of a Greek archbishop. The inhabitants are engaged in agriculture, fishing, and seafaring. Demotika is noted as the temporary residence of Charles XII. of Sweden after his defeat at Poltava. Population, about 5000, mostly Greeks.

DEMP'STER, THOMAS (c.1579-1625). A Scotch scholar and author, born at Cliftbog, in Aberdeenshire. The details of his life are given in an untrustworthy autobiography, but from other sources it seems that he was educated at Cambridge, and was professor first at Pisa and later at Bologna. He left a *Historia Ecclesiastica Gentis Scotorum* (1627), which, while curiously dishonest concerning earlier personages, is sometimes valuable for the information it gives of the author's contemporaries. The Ballantyne Club issued an edition of it in 1829. Dempster's best work is an annotated edition of Accolti''s *De Bello a Christianis contra Barbaros Gesto* (1623), and he also enjoyed a good reputation as a Latin poet.

DEMULCENTS (Lat. *demulcere*, to stroke down, soften, from *de*, down + *mulcere*, to stroke). Bland and lubricating liquid substances taken by the mouth for the purpose of soothing irritation of the mucous membranes of the gastro-intestinal tract, and reflexly of the larnyx and bronchi. The same substances are also given in enemata to relieve irritation of the lower portion of the bowels. Water must be classed as the most valuable of the demulcents. Demulcents are chiefly composed of starch, or gum, or of substances containing these, dissolved in water; sometimes also of oily matters, or the white of eggs, and other albuminous or gelatinous substances largely diluted. The decoction of althæa, or marshmallow, is a favorite form of demulcent; flaxseed tea is a common domestic remedy of this class.

DEMURRAGE (OF. *demorage*, from *demorer*, to delay, from Lat. *demorari*, to delay, from *de*, down + *morari*, to delay). In admiralty law, an allowance made to the master or owners of a ship by the freighter when she is detained in port by the latter beyond the specified time of sailing for his own convenience. A certain number of days, called running or working days, are allowed for receiving and discharging cargo, and it is usually

DEMOSTHENES

FROM THE STATUE IN THE MUSEUM OF THE VATICAN, ROME

stipulated in charter-parties that the freighter may detain the vessel, either for a specified time or as long as he pleases, on paying so much *per diem* for overtime. All the ordinary causes of detention, such as port regulations, the crowded state of the harbor, and the like, are at the risk of the freighter, and demurrage must be paid, though it be proved that the delay was unavoidable, unless it is due to the ship-owner's fault. The demurrage ceases as soon as the vessel is cleared for sailing, though she should be prevented from actually doing so by adverse winds. When the days of demurrage are limited by special contract, and the ship is detained beyond them, the sum due as demurrage under the contract will be taken as the measure of the loss for the further time which may be claimed in the form of damages. It will be open, however, to both parties to show that the rate thus fixed *per diem* is either too high or too low. Where there is no stipulation beyond the ordinary agreement that the usual time shall be allowed for loading and unloading, the master will be entitled, when this period expires, either to sail or to claim damages for detention. A suit for the recovery of demurrage is an admiralty and maritime case. Consult the authorities referred to under ADMIRALTY LAW.

DEMURRER. A pleading which in legal effect admits the facts alleged by the opposite party to be true for the purpose of argument, but denies that they are sufficient, as a matter of law, to sustain his claim; or which sets up that there is some other defect on the face of the pleading which is a legal reason why the plaintiff should not be allowed to proceed under it. It is always based solely upon what is stated in the pleading to which it is interposed, and cannot contain any other defense.

Its purposes vary somewhat in different jurisdictions; but, generally, in addition to denying that the facts alleged constitute a cause of action, it may be used to put in issue the jurisdiction of the court, the capacity of the plaintiff to sue, that another action is pending between the parties for the same cause, that there is a defect of parties plaintiff or defendant, or that several causes of action are improperly joined in the same pleading. It may be interposed to any pleading of either plaintiff or defendant which alleges 'new matter'—that is, something in addition to what was set out in the last previous pleading.

It is in the discretion of the court to allow the party whose pleading is thus attacked to amend if the objection is well taken and sustained, and great liberality is shown by the courts in this respect, especially where the defect is in some technical matter of form and an amendment curing it would not prejudice the opposite party. On the other hand, if the demurrer is overruled the demurrant is usually allowed to answer if he can convince the court there is probable merit in his proposed defense. These privileges are usually granted upon terms, as the imposition of costs to date of the argument. They have been abolished and other proceedings designed to accomplish like results substituted in the King's Bench and Chancery divisions of the High Court in England, but are retained and in constant use in most of the United States, both under the codes and the modified common-law system of pleading. See ANSWER; PLEADING.

DEMY, dė-mī′ (Fr. *demi*, from Lat. *dimidius*, half). A term applied to those holders of scholarships in Magdalen College, Oxford, called demyships. The name would seem to be a shortened form of the Latin *demi-socii* (half-fellows), the formal term by which they are more elegantly distinguished. Of the thirty-eight demyships, there are eight senior, valued each at £100, and thirty junior, of the value of £50 a year. Addison was a demy.

DEMY. A particular size of paper. In America, writing demy is a sheet 16 by 21 inches. In England, writing demy is 15 by 20 inches; printing demy is 17½ by 22 inches; and double demy, 26 by 38½ inches.

DENAIN, de-näɴ′. A town in the Department of Nord, France, on the left bank of the Scheldt, five miles southwest of Valenciennes (Map: France, K 1). It owes its prosperity to its situation in the centre of an extensive coal-field. The immediate vicinity of iron-mines also gives it unusual facilities for smelting, and its works of this kind are of considerable importance. Denain is a regular and well-built town, and has a good market. It has some manufactures of beet-root sugar, steel, candy, and spirits. Population, in 1896, 19,900; in 1901, 23,204.

DENA′RIUS (Lat. from *deni*, ten each, from *decem*, ten). The principal silver coin of ancient Rome. The earliest money of Rome was of bronze, and the standard was the *as*, nominally a pound of bronze. In B.C. 269 the *as*, which had decreased in size and value, was fixed by law at a lower valuation, and a silver coinage was introduced, with the *denarius* (= 10 *asses*) and the *quinarius* (= 5 *asses*). About B.C. 154 the *denarius* was made equivalent to 16 *asses* (still further reduced), and remained so (about 17 cents) until the time of Nero, after which it underwent a gradual diminution until silver money disappeared entirely in the third century A.D.

DEN′ARY SCALE. See NOTATION.

DE NATU′RA DEO′RUM (Lat., On the Nature of the Gods). A treatise on the nature of the gods by Cicero, containing an exposition of the Epicurean and Stoic philosophies, and a criticism of both from the point of view of the Academics. It is in the form of a conversation between representatives of the three schools.

DENBIGH, dĕn′bĭ (Welsh *Din-bach*, little fort). A municipal borough and the county town of Denbighshire, Wales, 30 miles west of Chester (Map: Wales, C 3). It stands in the vale of the Clwyd, on the sides and at the foot of a rugged, steep, limestone hill, crowned by the imposing ruins of a castle built in 1284 by Henry de Lacy, Earl of Lincoln, on the foundations of fortifications erected by William the Conqueror, and where there are traces of still earlier castellated remains. It sheltered Charles I. after the battle of Rowton Moor. It was taken by the Roundheads, but was dismantled after the Restoration. A lunatic asylum for the five counties of North Wales was erected near the town in 1848. It also contains a Bluecoat school and an asylum for orphan girls. The town's industry consists of the manufacture of boots and shoes, and trade in leather. Population, in 1901, 6400. Henry M. Stanley, the African explorer, was born near Denbigh.

DENBIGHSHIRE. A county of North Wales, on the Irish Sea and between the Dee and the Conway. It contains 666 square miles, with 8 miles of coast. The surface is partly rugged and mountainous; about two-thirds is under cultivation. Its corn, cheese, butter, and live stock are greatly esteemed. The chief towns are Denbigh, the capital, Wrexham, and Llangollen. Population, in 1891, 118,979; in 1901, 131,582.

DEN′BY, Charles (1830-1904). An American lawyer and diplomat, born at Mount Doy, Va. He studied at Georgetown University and the Virginia Military Institute; was admitted to the bar in 1855, and subsequently served in the State Legislature. During the Civil War he rose to be colonel of the Forty-second and the Eightieth Indiana Volunteer Infantry. From 1885 to 1898 he was Minister to China, and in the latter year became a member of the commission for the investigation of the conduct of the war with Spain. In 1899 he became a member of the civil commission for the Philippine Islands. He wrote *China and Her People*, 2 vols. (1905). Consult Little, *The Far East* (Oxford, 1905).

DENDERAH, dĕn′dĕr-ȧ (Gk. *Τέντυρα*, *Tentyra*, Coptic Tentore, perhaps 'the goddess,' evidently the end of a longer, mutilated name). A village of Upper Egypt, on the left bank of the Nile, opposite the large city of Keneh, in about latitude 26° 12′ N. It is celebrated for the ancient temple west of the village, one of the best preserved and most beautiful of ancient Egypt, although only of moderate size. The portico (51 yards wide) has twenty-four columns, bearing the head of the goddess of Denderah; the interior is divided into twenty-seven rooms. This temple is said to stand on the site of a building dating from the time of King Cheops (q.v.), which was restored in the twelfth and eighteenth dynasties. The present structure was begun under Ptolemy XIII., Auletes, and the temple was dedicated under Tiberius, although some details of the ornamentation date from his immediate successors. Among the many pictures and inscriptions, which are of rather moderate execution, a representation of the zodiac (or better, the sky) aroused much interest after its publication in the *Description d'Egypte;* it has, however, proved to be merely a mythological representation and of no value for astronomical purposes. Consult Letronne, *Observations sur l'objet des représentations zodiacales de l'antiquité* (Paris, 1824). For information about the cow-formed goddess Hathor of Denderah, see Athor. The tombs of the ancient princes of Denderah of the fourth to the eighteenth dynasty were excavated by Flinders Petrie in 1898. For the inscriptions, consult: Mariette, *Denderah* (Paris, 1870-80); Dümichen, *Baugeschichte des Denderatempels* (Strassburg, 1877).

DENDERMONDE, dĕn′dĕr-mŏn′dė. A fortified town of Belgium, in the Province of East Flanders, at the confluence of the Dender and the Scheldt, 18 miles east of Ghent. It has a fine church, which contains a number of paintings by Van Dyke and De Crayer, an old citadel, and an elaborately decorated fourteenth-century town hall (Map: Belgium, C 3). There are also several manufacturing establishments for the production of cotton goods, soap, and linen. Dendermonde was besieged in 1667 by Louis XIV., from whose hands it was saved by the opening of the sluices, which resulted in the flooding of the surrounding country. It was taken by the French in 1745. Population, in 1900, 9953.

DEN′DRITE (Gk. *δενδρίτης*, *dendritēs*, of or pertaining to a tree, from *δένδρον*, *dendron*, tree). The peculiar tree-like or branching effect found in minerals and due to the crystallization in them of certain metallic oxides, especially that of manganese. The well-known moss-agate or mocha stone is a typical illustration of the dendritic markings due to manganese oxide, which are distributed through the mineral, producing a moss-like appearance. Dendrites are frequently used as gem stones.

DENDRITE. A process which passes off from a nerve-cell. See Nervous System and Brain.

DEN′DROLITES. See Petrified Wood.

DENDROPH′AGUS. See Crown Gall.

DENFERT-ROCHEREAU, däN′fâr′ rô′she-rô′, Pierre Marie Philippe Aristide (1823-78). A French officer, born at Saint-Maixent (Deux-Sèvres). He studied at the Ecole Polytechnique, entered the engineer corps, and served as a captain in the Crimean War. In 1864 he was appointed chief engineer of Belfort, of which fortress he became governor with the rank of colonel in 1870. During the Franco-German War he defended the fortress from October, 1870, to February, 1871, and surrendered only when ordered to do so by the Government (February 16). He was elected to the National Assembly in 1871 and 1877. He assisted Thiers and de la Laurencie in the preparation of the *Histoire de la défense de Belfort* (Paris, 1871); and wrote *Des droits politiques des militaires* (1874). His heroic defense of Belfort is there commemorated by Bartholdi's colossal granite 'Lion.'

DENGUÉ, dĕn′gā (Sp. *dengue*, prudery, fastidiousness, from Lat. *denegare*, to deny, refuse), or Breakbone Fever, also called Dandy and Bucket Fever. A disease known in the southern parts of the United States and in the West Indies, where it was first described as having appeared in the years 1827 and 1828, and appearing as an epidemic in Australia, in 1897-98. Its symptoms are chill, fevers, headache, pain and swelling about the joints, and severe pain in the bones, a rose-colored eruption over the body, and great prostration. It is rarely fatal. The names "dengué" and "dandy" are said to have been applied to the disease because of the stiff erectness and careful walk of those afflicted. It is now believed to be a mosquito-borne disease. Quinine is used in its treatment.

DENHAM, dĕn′am, Dixon (1786-1828). An English explorer. He was born in London, and was educated at Merchant Taylors' School. He fought in the Peninsular campaign, distinguished himself at the battle of Toulouse by his daring and gallantry, and subsequently served in the Netherlands. He was associated with Clapperton and Oudney in an exploring expedition to Central Africa, which reached Lake Chad by way of Tripoli and Murzuk in 1823. In 1828 Denham became Governor of Sierra Leone. Consult his *Narrative of Travels and Discoveries in Northern and Central Africa* (1826).

DENHAM, Sir John (1615-69). An English poet, born in Dublin, Ireland, the son of an Irish judge bearing the same name. He was educated at Oxford, and studied law at Lincoln's Inn. His first publication was a tragedy, called *Sophy* (1642), performed with applause at Blackfriars. To 1642 also belongs the first version of *Cooper's Hill*, which is the earliest of English descriptive poems, and became Pope's model for *Windsor Forest*. According to Johnson, he should be credited with first making the heroic couplet terse and epigrammatic. In 1665 appeared a corrected edition of Denham's poem, containing the famous address to the river Thames: "O could I flow like thee," etc. Denham was engaged in secret service for Charles I., but being discovered, he was obliged to escape to France in 1648, returning thence to England in 1652. After the Restoration he was appointed surveyor-general of his Majesty's buildings, and created Knight of the Bath. The latter part of his life was darkened by madness, but recovering for a short time, he commemorated the death of Cowley in one of his happiest poems. He was buried in Westminster Abbey. Consult: Chalmers, *English Poets* (London, 1810); Ward, *English Poets* (London, 1880-83). There is no critical edition.

DENHARDT, dän'härt, CLEMENS (1852—) and his brother GUSTAV (1856—). Two distinguished German explorers, born in Zeitz. In association with the physician G. A. Fischer, they undertook in 1878 a tour through the Tana River region, East Africa, which they endeavored to secure to German commerce. Six years later they entered upon a second expedition, extending from the island Lamu to Vitu (March, 1885), where the Sultan of the Swahili requested the establishment of a friendly treaty with Germany based upon proposals made by him eighteen years previously. Part of the territory acquired by Clemens Denhardt was afterwards transferred by him to the German colonial society known as the *Deutsche Witugesellschaft*. In 1890 all rights to this territory were ceded by Germany to England in exchange for Helgoland, the German Government compensating the brothers with an indemnity of 150,000 marks. An important work by Clemens Denhardt was published in 1883 in the *Mitteilungen des Vereins für Erdkunde* at Leipzig under the title, *Anleitung zu geographischen Arbeiten bei Forschungsreisen*.

DENIA, dä'nē-ä (Lat. *Dianium*, from a temple of *Diana* situated there). A seaport town of eastern Spain, situated on the eastern coast of the Province of Alicante (Map: Spain, F 3). It has a small harbor and a lighthouse, and is the seat of an important trade in raisins and salt. In its vicinity are found some Roman antiquities. Pop., in 1897, 11,438; in 1900, 12,431.

DENIFLE, dâ-nē'fle, FRIEDRICH HEINRICH SUSO (1844-1905). An Austrian theologian, born at Imst, Tyrol. He studied at Brixen, and in 1861 entered the Order of the Dominicans at Gratz. Having received holy orders in 1866, he completed his studies in Rome and after his return to Gratz taught theology in the Dominican monastery and also acquired high repute as a pulpit orator. Summoned to Rome in 1880 as representative of his Order for Germany, he was appointed archivist in the Vatican in 1883, and intrusted with a new edition of the works of Thomas Aquinas. He is an authority on the mystic literature of the Middle Ages. Among his principal writings are: *Die katholische Kirche und das Ziel der Menschheit* (Gratz, 1872); *Das geistliche Leben. Eine Blumenlese aus den deutschen Mystikern des 14. Jahrhunderts* (ib., 1873; 4th ed. 1895); *Die Schriften des seligen H. Seuse* (Munich and Augsburg, 1876-80); *Das Buch von der geistlichen Armut* (Munich, 1877); *Die Universitäten des Mittelalters bis 1400* (Berlin, 1885); *Die päpstlichen Registerbände des 13. Jahrhunderts*, etc. (ib., 1886); *Les universités françaises au moyen âge* (Freiburg, 1892). He was associated with Franz Ehrle in editing the *Archiv für Litteratur und Kirchengeschichte des Mittelalters*.

DENINA, dâ-nē'nâ, GIACOMO MARIA CARLO (1731-1813). An Italian historian, born at Revello, Piedmont. He received his education at Saluzzo, and in the Royal College of Turin, and having taken holy orders, was employed in 1754-58 in teaching in the schools at Pinerolo, Cuorgnè, and Barge. In 1758 he was appointed professor of belles-lettres at the Superior College in Turin, and in 1770 professor of rhetoric and afterwards of Greek at the university. As he had incurred the enmity of the Jesuits by the liberal views expressed in his writings, he was subjected to a good deal of persecution on their part, and readily accepted an invitation extended to him by Frederick the Great in 1782 to come to Berlin, where he was elected a member of the Academy. Presented, in 1804, at Metz, to Napoleon, to whom he had dedicated his linguistic work, *La clef des langues*, he was appointed by him Imperial librarian, and thenceforth lived in Paris. His literary reputation rests chiefly on the history, *Delle rivoluzioni d'Italia* (1769-72). Considerable interest was aroused by his *Discorso sopra le vicende della letteratura* (1760), in which were reviewed the literary vicissitudes of all nations from their origin to modern times, and which was translated into all the principal languages of Europe. Among his other numerous historical writings may be mentioned: *Istoria politica e letteraria della Grecia* (1781-82); *La Prusse littéraire sous Frédéric II.* (1790-91); *Rivoluzioni della Germania* (1804); *Istoria dell' Italia occidentale* (1809). He also wrote *La Russiade*, an epic in prose, in glorification of Peter the Great.

DENI'O, HIRAM (1799-1871). An American jurist, born at Rome, N. Y. Several years after his admission to the bar he removed to Utica, where he became distinguished as a lawyer. He was three times elected judge of the Court of Appeals and retired from that office in 1866. He was one of the most distinguished jurists of his day, and his decisions are often cited. His works include: *Reports of Cases Argued and Determined in the Supreme Court and in the Court for the Correction of Error* (5 vols., 1845-48); and an edition of the *Revised Statutes of New York*, in collaboration with William Tracy (2 vols., 1852).

DEN'IS, *Fr. pron.* de-nē', or DIONYSIUS, Saint. The apostle of France and first Bishop of Paris, who, according to tradition, suffered martyrdom in the third century. He was sent, it is said, from Rome about A.D. 250 to preach the gospel to the Gauls. After various detentions at Arles and other places, he arrived in Paris, where he made numerous proselytes. Sisinnius Fescennius, who was then the Roman governor of this part of Gaul, ordered Denis to be brought before him, along with two other Christians, Rusticus, a priest, and Eleutherius, a deacon. As they continued firm in their faith in spite of threats, he caused them to be cruelly tortured, and afterwards beheaded, A.D. 272, or, as others say, 290. Gregory of Tours, Fortunatus, and the Latin martyrologists, state that the bodies of the three martyrs were thrown into the Seine, but taken up by a pious woman named Catulla, and interred near where they lost their lives. At a later period a chapel was built over their tomb. In 636 King Dagobert founded on the spot the Abbey of Saint Denis. The Greek Church makes Saint Denis to be the same person as Dionysius the Areopagite, first Bishop of Athens (q.v.). The Roman Catholic Church celebrates his memory on October 9th. For a long time his name was the war-cry of the French soldiers, who charged or rallied to the words *Montjoye Saint Denis*. Consult: Vercelly, *Vie de Saint Denis* (Paris, 1854); Tailliar, *Apostolat de Saint Denis* (Amiens, 1869).

DENIS, de-nē′, JEAN FERDINAND (1798-1890). A French traveler and author. He was born in Paris, and early devoted himself to the study of the principal European and Oriental languages with a view to a diplomatic career. His love of travel, however, induced him to go to South America in 1816; he spent several years in Brazil, studying its condition and resources, and after his return home prepared to write a history of that realm and of some of the other South American countries, and subsequently visited Portugal and Spain. In 1838 he was appointed librarian in the Ministry of Public Instruction, and in 1841 custodian of the library of Sainte Geneviève, of which he became administrator in 1865. Among the great number of his writings may be mentioned: *Le Brésil, ou histoire, mœurs, usages et coutumes de ce royaume* (1821); *Buenos Ayres et le Paraguay* (1823); *La Guyane* (1824); *Scènes de la nature sous les tropiques, et de leur influence sur la poésie* (1824); *Résumé de l'histoire littéraire du Portugal et de l'histoire littéraire du Brésil* (1826); *Chroniques chevaleresques de l'Espagne et du Portugal* (1837); *Le Brahme voyageur ou la sagesse populaire de toutes les nations* (1833); and *Camoëns et ses contemporains* (1841).

DENIS, dâ-nēs′, MICHAEL (1729-1800). An Austrian bibliographer and poet. He was born at Schärding, Upper Austria, and was educated at Passau by the Jesuits, whose Order he joined in Vienna in 1747, devoting himself to the profession of teaching. In 1759 he became professor at the Theresianum, and on the suspension of the Society of the Jesuits in 1773 was intrusted with the supervision of the Garelli Library, connected with the Theresianum. When that institution was closed by order of Joseph II., in 1784, Denis was appointed custodian of the Imperial Library. He deserves much credit for having elevated the standard of bibliography as a science, but his chief merit is that he awakened and spread the literary taste in Austria, making that country participate in the revival of letters which was then agitating Germany. He translated Ossian into German, and was a great admirer of Klopstock, in imitation of whose bard poetry he composed lyrics under the name of "Sined the Bard." His poetic productions comprise: *Poetische Bilder der meisten kriegerischen Vorgänge in Europa seit 1756* (1760); *Die Lieder Sineds des Barden* (1773); and *Ossians und Sineds Lieder* (1784-85). Among his valuable bibliographical writings are: *Grundriss der Bibliographie und Bücherkunde* (1774); *Einleitung in die Bücherkunde* (1777-78); *Merkwürdigkeiten der Garellischen Bibliothek* (1780); *Wiens Buchdruckergeschichte bis 1560* (1782; supplement, 1793); *Lesefrüchte* (1797).

DENIS, PAUL CAMILLE (1795-1872). A German civil engineer, born at Mainz. He studied at the Ecole Polytechnique of Paris, entered the Bavarian civil service, and in 1834 became a member of the commission for the construction of the Danube-Main Canal. In 1835 he built from Nuremberg to Fürth the first railway in Germany. Subsequently he was prominent as a builder and director of railways.

DEN′ISON. A city and the county-seat of Crawford County, Iowa, 65 miles north by east of Council Bluffs, on the Boyer River and on the Illinois Central and the Chicago and Northwestern railroads (Map: Iowa, B 3). It is the seat of a normal college, and carries on a considerable trade in live stock, grain, flour, poultry, dairy products, etc. The leading industrial establishments are flouring-mills and creameries. Population, 1900, 2771; 1905, 3173.

DENISON. A city in Grayson County, Tex., 72 miles north by east of Dallas, on the Missouri, Kansas and Texas, the Texas and Pacific, the Houston and Texas Central, and the Saint Louis and San Francisco railroads (Map: Texas, F 3). It has important commercial interests, and contains cotton, cottonseed-oil, as well as flouring mills, and many smaller industries. Among the more important buildings may be noted Saint Xavier's Academy and Washington School. Settled in 1872, Denison was incorporated the same year, and is now governed under a charter of 1891, revised in 1905. The mayor is elected for two years, and the city council chosen in part by wards and in part on a general ticket. The board of appeals is nominated by the executive; all other officials except the city secretary are elected by the people. Population, 1900, 11,807; 1904 (local est.), 15,000.

DENISON, CHARLES WHEELER (1809-81). An American clergyman and author, born in New London, Conn. For a time he edited the *Emancipator*, one of the early anti-slavery periodicals; in 1853 was appointed United States Consul in British Guiana, and during the Civil War spoke in behalf of the Federal cause among English workmen in Lancashire, and was post-chaplain at Winchester, Va., and a hospital chaplain at Washington, D. C. His publications comprise two volumes of verse, *The American Village and Other Poems* (1845), and *Out at Sea* (1867); a story, *Antonio, the Italian Boy* (1873); and biographies of Generals Grant, Hancock, and Banks.

DENISON, GEORGE TAYLOR (1839—). A Canadian soldier and author, born in Toronto. He was educated at Upper Canada College and Toronto University (LL.B., 1861), was called to the bar in 1861, and in 1866 became lieutenant-colonel of the Governor-General's bodyguard. In 1872 and 1873 he was sent by the Government of Ontario to England as a special commissioner on matters connected with immigration, in 1877 was appointed police magistrate of Toronto, and in 1885 was elected president of the Royal Society of Canada. He was on active military service during the Fenian raid in 1866, and again during the rebellion led by Riel in the Northwest Territories in the spring of 1885. His *History of Cavalry* (1877) won the prize of 5000 rubles offered by the Czar for the best work on that subject, was translated into Russian, and subsequently also into German and Japanese. He has been known as an earnest advocate of Imperial unity.

DENISON UNIVERSITY. An educational institution, situated at Granville, Ohio. The university was organized by the Baptist Education Society in 1831 as a manual labor school, under the name of the Granville Literary and Theological Institution. The manual-labor idea, however, did not prove successful and was soon abandoned. In 1856 the name of the institution was changed to Denison University, in honor of William S. Denison, one of its principal benefactors. The theological department was discontinued in 1870. The university offers degrees in arts and science. In 1900 Shepardson College for women, established in 1887, became affiliated with the university. The property value of the two institutions, including their endowment funds, is estimated at about $1,000,000. The university had a registration in 1906 of over 500 students. The library contained about 25,000 volumes besides pamphlets.

DENITRIFICATION. See NITRIFICATION.

DENIZEN (AF. *denzein*, *denezyn*, OF. *deinz*, Fr. *dans*, within, from Lat. *de*, from + *intus*, within). One who was born an alien (q.v.) to his adopted country, but who has been granted some of the privileges of citizenship. In England 'denizen' signifies one who has been admitted to become a citizen by letters patent from the Crown, his rights dating from the time when they were conferred; and he is distinguished from a naturalized citizen, whose rights are granted by Parliament, and are retroactive, putting him in the same status as if he were a natural-born citizen. A denizen in England is also under certain political disabilities as to holding office, and he is subject to certain taxes from which other citizens are exempt. He is said, therefore, to occupy a middle position between an alien and a natural-born or naturalized subject. In the United States the terms denizen and naturalized citizen are used synonymously, there being no distinction. Naturalization (q.v.) is held here not to be retroactive; but when one becomes a denizen or naturalized citizen, he has practically all the rights and privileges of a natural-born citizen from that time. The Constitution provides that no one not a natural-born citizen may become President, but otherwise there are no constitutional limitations on the rights of a naturalized citizen. See CITIZEN; NATURALIZATION; SUBJECT.

DENIZLI, dĕn'ĭz-lē' (Turk. *deniz*, sea). A town of Asiatic Turkey, in the Vilayet of Smyrna, on the Smyrna-Dinair Railway (Map: Turkey in Asia, C 4). In its vicinity are situated the ruins of ancient Laodicea. The situation of Denizli amid beautiful gardens and vineyards at the base of the Baba Dagh has earned it the title of the 'Damascus of Anatolia.' It has a bazaar, khâns, and leather curing and manufacturing industries. Population, about 17,000.

DENK, HANS (c.1495-1527). A German Anabaptist. He was born in Bavaria; studied at Ingolstadt, was proof-reader in Basel, rector of a school at Nuremberg in 1523, and there met Thomas Münzer, and so first came in contact with Anabaptism, which he accepted with modifications. In consequence he was banished from the city, January, 1524, and forced upon that wandering life which he henceforth led until his death, in Basel, November, 1527. His writings are very scarce. He was essentially a mystic, and, like his class, mingled truth and error. For his life, consult L. Keller (Leipzig, 1527).

DEN'MAN, THOMAS, Baron (1779-1854). An English jurist. He was born in London, studied at Cambridge, and was called to the bar in 1806. On the accession of George IV. he was appointed solicitor-general to the Queen, and in conducting her defense won a considerable reputation both as a lawyer and as a speaker, but earned the enmity of the King, who for some time thereafter opposed his advancement. In 1818 he was elected to Parliament, and took a seat with the Whig Opposition, serving there until 1826 and being returned again in 1830. In the latter year he was made Attorney-General, and two years later became Lord Chief Justice of the King's Bench. In 1834 he was raised to the peerage. He resigned the office of Chief Justice in 1850. His character was marked by high moral and social virtues. As a jurist he was especially interested in the subject of law reform, and instituted important changes in the code. He also strove with great energy, both as a writer and as a judge, to effect the abolition of the slave trade.

DEN'MARK. The smallest of the three Scandinavian kingdoms of Europe (Map: Europe, D 3, and special map). It comprises the northern portion of the Cimbrian Peninsula, called Jutland, the Danish Archipelago east of the peninsula, the island of Bornholm, and the Faroe Islands, making a total area of 15,385 square miles. Not reckoning the Faroe Islands, it lies between latitudes 54° 33′ and 57° 45′ N. It is almost surrounded by the sea, Jutland being connected with the Continent only at the southern frontier, in which place the peninsula is less than 40 miles wide.

TOPOGRAPHY. The western and northwestern coasts of Jutland, which are washed by the North Sea, and the Skagerrak, are low and girt by dunes and sand-bars. Behind the dunes there are several large lagoons or inclosed bays, but they are usually too shallow to serve as harbors. The northern extremity of Jutland is formed by the Skagen, a long, curved sand-pit. The east coast along the Cattegat lies at a somewhat higher level, and is indented by a series of inlets (fjords) that penetrate deeply into the interior; Limfjord, the most northerly, reaches across the peninsula and communicates through a tortuous course with the North Sea. Some of the inlets may be entered by ships of light draught. Between the south of Jutland and the southern extremity of Sweden are Fünen and Zealand, the largest islands of Denmark, dividing the outlet of the Baltic into three passages—the Little Belt, between Jutland and Fünen; the Great Belt, separating Fünen and Zealand; and the Sound between Zealand and Sweden. Both islands have an irregular and sandy coast line. The surface of Denmark is uniformly low. A ridge of hills crosses the middle portion of Jutland from the southern frontier to the Limfjord, the highest points of which are less than 600 feet above the sea; and this elevation is not exceeded elsewhere. The ridge constitutes the water parting between the North Sea, which receives the Stor Aa, the Lönborg Aa, and the Varde Aa, and the Cattegat, which receives the Guden Aa. The last named is the largest river of Denmark, and has a length of about 100 miles.

Climate. The climate of Denmark is like that of eastern Scotland, but it is somewhat warmer in summer and colder in winter. The mean temperature at Copenhagen is about 60° F. in summer and about 32° in winter. In general the islands have a milder climate than Jutland. In winter the Sound and other channels are sometimes filled with drifting ice; the blockade, however, does not continue for any length of time. Heavy rains are frequent in autumn, and mists in summer, especially on the western coast of Jutland.

Flora. The flora of Denmark includes many of the common European plants, and a number of species peculiar to the moorlands. Formerly there were extensive forests of pine and fir, but these trees are now practically limited to cultivated lands. The trees most commonly found are the oak and the beech. About 5 per cent. of the total area is forested.

Fauna. The fauna has no noteworthy characteristics. Fishes and aquatic birds abound. Salmon are found in the Guden Aa, and oysters in a few localities. In 1903 the value of the fish caught was $2,667,000.

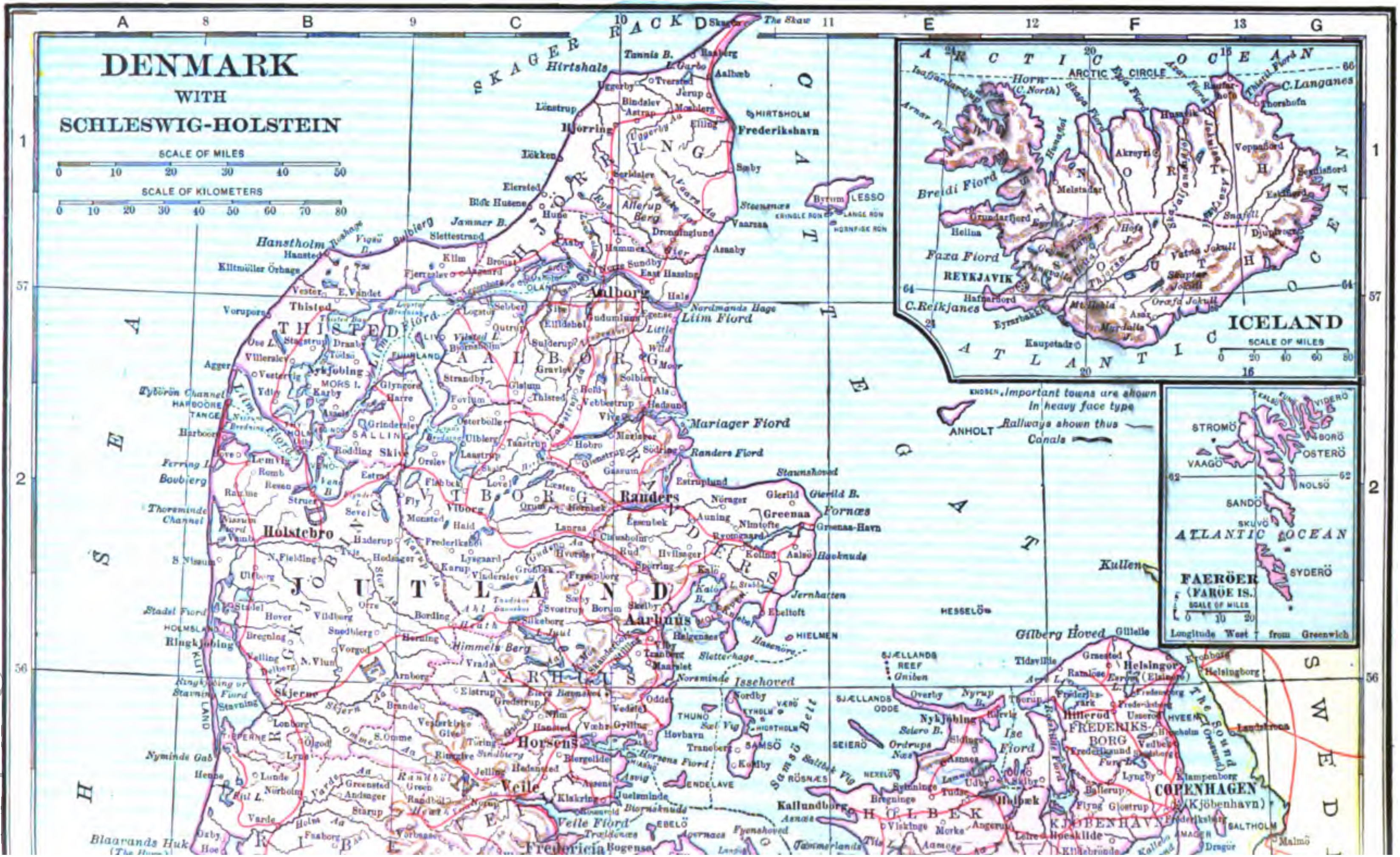
Geology. With the exception of Bornholm, which belongs physically to Sweden, the entire area of Denmark may be regarded as a continuation of the plains of North Germany. The surface consists of boulder clay and sand, resting upon stratified rocks of generally Cretaceous age. The clay was deposited during the Pleistocene epoch by the Scandinavian ice-sheet. In the west and north of Jutland there are large tracts of moorlands which yield peat, but no metallic ores occur in any part of the country. Bornholm is formed by Paleozoic and Mesozoic rocks, and has the same geological structure as the southern part of Sweden. Kaolin and a poor grade of coal are mined on this island.

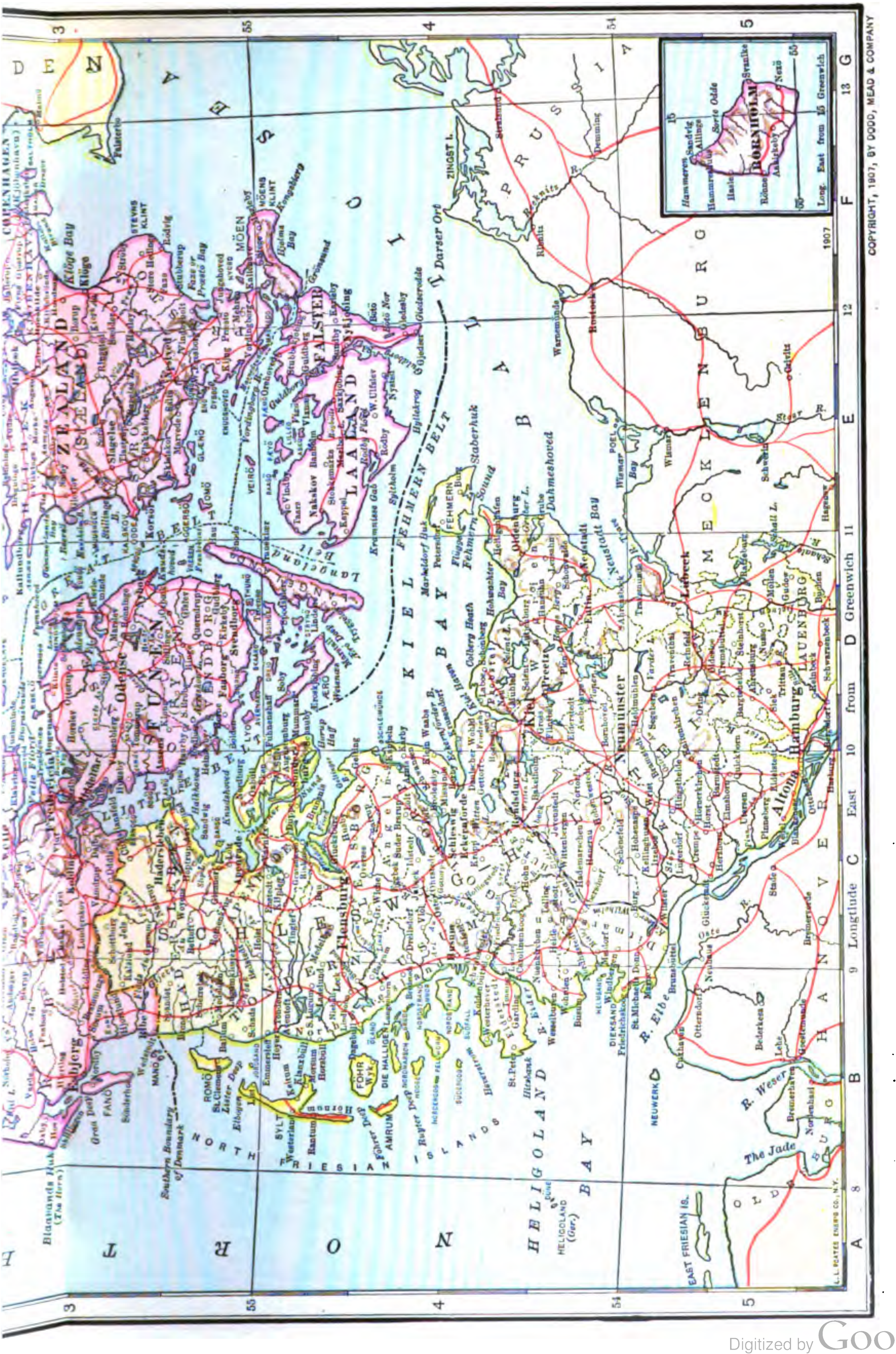
Agriculture. Denmark proper is essentially an agricultural country. About 80 per cent. of the total land surface is productive, and of this area about 35 per cent. is arable, 41 is pasture, and the remainder is mainly forest. Nearly 39 per cent. of the population are engaged in agriculture. The laws forbid the uniting of small farms into large ones, and favor the parceling out of landed estates. The peasant proprietors are consequently increasing both in number and importance. The division of the land into very small holdings is successfully associated with a well-developed system of coöperation, which enables small farmers to use the most improved and expensive machinery, etc. Tenants in good standing have absolute charge of their land. Of the area under chief crops in 1901, about 32 per cent. was in oats, 20 per cent. in rye, and 20 per cent. in barley. In 1904 the agricultural production was as follows in hectolitres (the hectolitre equals 2.75 bushels): wheat, 1,516,000; barley, 8,002,000; oats, 13,455,000; rye, 5,830,000; potatoes, 8,533,000; beetroots, etc., 86,339,000. Stock-raising is a prominent industry. In 1903 there were 486,935 horses, 1,840,466 cattle, and 876,830 sheep in the country. The dairy industry is fostered by a general coöperative plan, and has reached a high degree of development. Denmark butter is of a superior grade, and the trade in it has increased at a remarkable rate.

Manufactures. The manufacturing industries are chiefly on a small scale. The census of 1897 gives the number of industrial establishments as 77,256, employing nearly 177,000 wage-earners, or about 7 per cent. of the total population. Of these establishments but 1062 had a working force of from 20 to 100, and only 165 employed over 100 hands each. The principal manufactures are furniture, foodstuffs, articles of apparel, and metal products. The textile industries are confined chiefly to the rural districts. Manufacturing is increasing in importance, partly in consequence of the industrial schools. Most of the important plants are in Copenhagen. In 1904 the distilleries in the whole country numbered 41 and their output of brandy amounted to 7,428,000 gallons. In that year 44,125 tons of beet sugar and 21,885 tons of margarin and oleomargarine were produced. There is some manufacturing of machinery and of pottery; also a little iron-smelting. The industrial joint-stock companies of Denmark are a significant feature in its manufacturing development. Their combined capital nearly doubled during the last decade of the Nineteenth Century.

Transportation and Communication. Most of the towns of Denmark are situated on the coast or on navigable rivers. Steamboats ply constantly between the islands. The first railway within the present confines of the country (Copenhagen-Roeskilde) was constructed by a private company and opened for traffic in 1847. Prior to 1880 the State railway lines were confined to the mainland and the island of Fünen, while private companies controlled all lines on the islands of Zealand, Laaland, and Falster. In 1880 the Government passed a bill authorizing the acquisition of the Zealand lines. In 1904, out of a total of 1993 miles, the State owned 1138 miles, the total cost of which up to March 31, 1903, was over $48,200,000. The total railway mileage at the beginning of 1905 was 1997. There were 2367 miles of State telegraph lines at the end of 1904. The merchant marine of Denmark and the colonies comprised, at the same period, 4048 vessels with a total registered tonnage of 473,409, including 592 steamers with a tonnage of 323,891. During 1904 there entered the Danish ports, aside from coasting vessels, 33,204 vessels, with a tonnage of 3,337,000, and 34,312 vessels of 1,057,000 tons cargo cleared.

Commerce. The commercial expansion of Denmark has been very considerable. The general imports show a gain from $82,300,000 in 1890 to $160,597,000 in 1904, while the exports increased from $62,600,000 to $133,420,000. The special commerce (imports for consumption and exports of domestic produce or manufacture) amounted in 1905 to $128,372,000 for imports, and $104,520,000 for exports. These figures exclude precious metal. The exports of Denmark consist almost entirely of animal and dairy products. The imports are chiefly cereals, animal and dairy products, coal, metals, and hardware, textiles, and groceries. Germany occupies the first rank in the general import trade of the country, furnishing about 36 per cent. of the imports. Great Britain follows (15 per cent.), then the United States (13 per cent.), Sweden, Norway, and Russia. In the export trade Great Britain stands first, taking 57 per cent. of the total shipments—mostly butter (nearly $45,000,000 in 1904), bacon, and eggs. The other countries importing from Denmark are,


DENMARK
WITH
SCHLESWIG-HOLSTEIN
SCALE OF MILES
0 10 20 30 40 50
SCALE OF KILOMETERS
0 10 20 30 40 50 60 70 80
SKAGER RACK
KATTEGAT
NORTH SEA
JUTLAND
Copenhagen (Kjöbenhavn)
Aalborg
Randers
Aarhuus
Horsens
Veile
Holstebro
Frederikshavn
Hjörring
Viborg
Skive
Nykjöbing
Thisted
Fredericia
Helsingör
Helsingborg
Limfjord
Mariager Fiord
Randers Fiord
The Sound (Oresund)
Samsö
Lesso
Anholt
Hesselö
Kullen
Important towns are shown in heavy face type
Railways shown thus
Canals
ICELAND
SCALE OF MILES
0 20 40 60 80
ARCTIC OCEAN
ARCTIC CIRCLE
ATLANTIC OCEAN
REYKJAVIK
C. Reikjanes
Faxa Fiord
Breidi Fiord
C. Langanes
Vatna Jokull
FAERÖER (FAROE IS.)
SCALE OF MILES
0 10 20
Stromö
Osterö
Vaagö
Sandö
Syderö
Longitude West from Greenwich
SWEDEN
A B C D E F G
8 9 10 11 12 13
1 2
57 56



COPYRIGHT, 1907, BY DODD, MEAD & COMPANY

in order of their importance, Germany, Sweden, and Russia. The trade of the United States with Denmark has increased with very great rapidity. In 1895 it amounted to about $3,300,000, while in 1904 it reached nearly $24,332,000, of which amount only about $4,375,000 represented exports from Denmark. Among the principal imports from the United States are corn, cotton, iron and steel manufactures, cotton-seed, and oil.

BANKS. Denmark has about 100 banks. The assets and liabilities of the National Bank approximated $41,810,000 in 1904, about 41 per cent. of which was in specie and bullion. Its note circulation was over $27,500,000. Its capital is about $7,250,000. The number of savings banks in 1903 was 538, with 1,254,821 accounts and more than $196,444,000 deposits. Nearly 51 per cent. of the population are depositors, with an average individual deposit of over $156.50.

GOVERNMENT. Denmark is a constitutional monarchy based upon the fundamental law of June 5, 1849, as revised in 1866. The law-making power is vested in the King and in the National Legislature, or Rigsdag, consisting of an Upper House (Landsthing) and a popular chamber (Folkething). The Landsthing is composed of 66 members, of whom twelve are appointed for life by the Crown, and the remainder are chosen for a term of eight years, partly by the representatives of the highest taxpayers in the towns and rural districts and partly by the representatives of the people at large. The Folkething is at present composed of 114 Deputies, the constitutional ratio being one Deputy for every 16,000 of the population. Members of the Lower House are elected for a period of three years by all male citizens above the age of thirty not engaged in menial household service and resident for a year in the district in which they enroll. Legislation may be initiated in either House, but financial bills must be submitted in the first instance to the Folkething, and only on the initiative of the Crown. In practice the Upper House enjoys a very large degree of influence, owing to its feature of comparative permanency; and in conjunction with the King, who wields an absolute veto on legislation, it is frequently in the position of directing the action of Parliament. The executive power is vested in a council of eight responsible Ministers, who preside over the departments of Foreign Affairs, Finance, Interior, Justice, War, Navy, Public Instruction and Worship, and Agriculture.

Justice is administered in the first instance by the judges of the hundreds in the rural communities and by the city magistrates in the urban districts. Appeals from such courts lie to the superior courts of Viborg and Copenhagen, and in the last resort to the Supreme Court of 24 judges (Hojesteret) at Copenhagen. Together with four judges especially appointed by the Landsthing, the Supreme Court sits as a tribunal for the cases of impeached Ministers.

ARMY AND NAVY. The Danish army is raised by conscription from among all citizens above the age of twenty-two. Substitution is not permitted. The terms of service are eight years with the regular army and its reserve and eight years with the supplementary reserve. The standing army in 1905 approximated 825 officers and 9000 men. The war footing of the nation is estimated at 62,000 men. The navy is maintained only for purposes of coast defense. See ARMIES AND NAVIES.

FINANCE. The national budget for 1906-7 estimated a revenue of $22,920,000, and an expenditure of $23,016,000. Five-sevenths of the revenues are derived from indirect taxes, for the most part customs and excise. Direct taxes and the income from national assets furnish nearly all the remainder. Of the expenditures, the following are the largest items: Improvement of State property and reduction of debt, about one-seventh; Ministry of War, one-seventh; interest and expenses on State debt, one-tenth; Ministry of Public Worship and Instruction, Ministry of Marine, and Ministry of Interior, each about one-twelfth. A noteworthy feature of the finances of the kingdom is a reserve fund of comparatively a large amount, being about $4,775,000 in 1904. It was formerly very much greater, having been about $31,155,000 in 1867. The fund was started after the war of 1864 and is designed to furnish means for the Government in case of sudden emergency. The public debt is relatively small, amounting in 1906 to about $64,232,000. Over 70 per cent. of the debt is held abroad and is mostly at 3 per cent.

COLONIES. Iceland, with an area of about 40,458 square miles, has (1901) 78,470 inhabitants; Greenland (the portion free of ice, which is but a small fraction of the territory belonging to Denmark), with an area of about 34,000 square miles, had (1901) 11,895 inhabitants; and the Danish West Indies (Saint Croix, Saint Thomas, and Saint John), with an area of 138 square miles, a population (1901) of 30,527. In 1904 the value of their imports into Denmark was about $887,000, and of the exports to them from Denmark $1,019,000. Of this trade Iceland furnished 83 per cent. and Greenland 15 per cent. See ICELAND; GREENLAND, etc.

POPULATION. According to the census of 1906 the population of Denmark was 2,604,149, showing an increase of nearly 5.6 per cent. since 1901. The urban population (five-twelfths of the total) increased during the decade 1891-1901 about 30 per cent., while the rural population shows a gain of but 4 per cent. There were 8051 emigrants in 1905, mainly to the United States. The emigration figures, which were 4105 in 1894 and fell to 2260 in 1897, have since then manifested a marked upward tendency, and were 9034 in 1904. The Danes are a Teutonic people of the Scandinavian group. Height 1.685 meters; hair, wavy, light brown or chestnut; eyes blue; complexion pale white, swarthy, or very light brown. The established Church is the Lutheran. Primary education is free and compulsory between the ages of seven and fourteen, and is very thoroughly diffused. The numerous high schools, mostly private, have an attendance of over 56,000. Denmark has one university, that of Copenhagen. There are also an agricultural and a veterinary college, 21 agricultural or horticultural schools, the Royal Academy of Art (founded in 1754), the Polytechnic Institute, two academies (Sorö and Herlufsholm), and about 100 technical and commercial institutions.

HISTORY. Of the primitive history of Denmark little is known. The kitchen-middens and other primitive remains indicate the early presence of paleolithic man in the Danish peninsula. The sagas hand down myths and traditions of later but still early ages, when the original inhabitants had been crowded out by wandering tribes of Germanic stock, and Jutland and the islands had become the homes of Saxons, Angles, and Jutes. The Germanic occupation was complete about the second century of our era, but this was followed by an invasion of the Danes in the fifth and sixth centuries. Less influenced than the other Teutonic peoples by the Romans, the inhabitants in the Scandinavian countries developed a striking and characteristic civilization, marked by a warlike and adventurous spirit, which sent them as Vikings and conquerors over all Europe and as far as America. Christianity made its way into Denmark as early as the fifth or sixth century. After the ninth century we find a united Danish kingdom growing out of the petty principalities into which the country was divided. We hear of Danish kings as early as the beginning of the tenth century, when Gorm the Old (c.900-35) showed himself a bitter opponent of Christianity; but the first Danish ruler of prominence was Svend (Sweyn) I., of the Forked Beard (985-1014), a redoubtable sovereign who for a brief period imposed his yoke upon England. Svend's son, Knut or Canute (died 1035), King of England and Denmark, was a really great sovereign, under whom the conversion of the Danes to Christianity was completed and much was done to civilize the kingdom and bring it into order. After his death the northern empire which he had created fell apart, and the Odinic dynasty of the Skjoldungs became extinct in 1047.

Svend Estridsen, son of Knut's sister, now ascended the throne. Internal dissensions and external wars led here as elsewhere to the introduction of a feudal system. A new era of brilliant achievements began with Valdemar I., the Great (1157-82), and continued under Knut VI. (1182-1202) and Valdemar II., the Victorious (1202-41). These kings extended the conquests of Denmark far into German and Wendic lands and made the Baltic little more than a Danish sea. The jealousy of the German princes and the treachery of his vassals combined to rob Valdemar II. of these conquests. His death in 1241 was followed by a century of anarchy, during which the kingdom was brought near to destruction under the vicious rule of his sons and grandsons. Under Valdemar IV. (1340-75), the last of the Estridsen line, Denmark recovered for a time the conquests of the elder Valdemars, and the national laws were collected into a well-digested code. From 1375 until 1412 Valdemar's daughter, the great Margaret, ruled Denmark, at first as regent for her young son Olaf, and after his death as Queen. Denmark, Norway, and Sweden were united under her sovereignty, and this was confirmed in 1397 by the act known as the Union of Kalmar. Margaret's successor, Erik (1412-39), the son of her niece, undid her work with fatal rapidity, lost his triple kingdom, and died in obscurity. After the short reign of his nephew, Christopher of Bavaria, the Danes, on the death of the latter in 1448, reasserted their ancient right of election to the throne, and chose for their King Christian of Oldenburg, a descendant of the old royal family through his maternal ancestress, Rikissa, the great-granddaughter of Valdemar II. Christian I. was the father of the Oldenburg line, which continued unbroken till the death of Frederick VII. in 1863. Christian was chosen ruler by the estates of Schleswig and Holstein in 1460, promising for his successors that they should forever leave the two lands united. As rulers of Holstein (which was included in the Holy Roman Empire), the kings of Denmark became members of the Germanic body. Christian I.'s reign was followed by half a century of continuous warfare and anarchy in Scandinavia. The tyranny of Christian II. (1513-23) cost him his throne. His bloody atrocities in Sweden were followed by the successful vindication of the independence of that country by Gustavus Vasa. Christian's subjects chose his uncle, Frederick I. (1523-33), to be their King, while Sweden was forever separated from Denmark. Under Christian II. Denmark first began to enter into extensive treaty relations with other European States. Christian III. (1534-59), in whose reign the Reformation was established, united the Schleswig-Holstein duchies in perpetuity to the Crown. His partition of the greater part of these provinces among his brothers became a source of much mischief. Frederick II. (1559-88) further complicated matters in regard to the duchies by making additional partitions in favor of his brother, the founder of the Holstein-Sonderburg family. He was succeeded by Christian IV. (1588-1648), who was one of the ablest of Danish rulers, although his foreign wars were disastrous, while his liberal and wise internal policy was cramped in every direction by the nobles. He fought for Protestantism in Germany in the Thirty Years' War and was utterly defeated. Toward the end of his reign he engaged in an unsuccessful war against Sweden, which now became the dominant power on the Baltic. In the reign of Christian's son, Frederick III. (1648-70), Denmark had to surrender all her possessions in the Swedish portion of the Scandinavian peninsula.

In 1660 Frederick III., with the assistance of the clergy and the burghers, who had joined him in opposing the pretensions of the nobles, declared the crown hereditary, and the royal authority absolute, and ushered in a new régime. The power of the nobility was reduced, but the peasantry and burghers profited little by the change. Many improvements were, however, effected in the mode of administering the laws, and the Danish kings, although autocrats, exercised a mild rule. The abolition of serfdom was begun in 1767 by Christian VII. (1766-1808), but was not finally completed till twenty years later; it was extended to the Schleswig-Holstein duchies in 1804. The misfortunes due to the relations maintained by Denmark with Napoleon brought the country to the verge of ruin, by plunging it into war with Sweden, England, Russia, and Prussia, and although it speedily rallied from the losses inflicted in 1801 by the battle of Copenhagen, the fresh rupture with the Allies, which ended in the compulsory surrender to the English of the entire fleet, after the destructive bombardment of Copenhagen (September, 1807), completely paralyzed the nation. By the Peace of Kiel in 1814 Frederick VI. of Denmark (1808-39) was compelled to cede Norway to Sweden. The discontent that had long been prevailing in Schleswig and Holstein developed after 1830 into mutual animosity between the Danish and German population. The anticipated failure of heirs to the throne complicated the questions at issue, and in 1848, immediately after the succession of Frederick VII., the German element in Schleswig and Holstein, being encouraged by the Frankfort Parliament (which voiced the revolutionary movement in Germany), and perhaps still more by Prussia, rose in arms against Denmark. After alternate hostilities and armistices, the first Schleswig-Holstein War, in which the Danish troops fought bravely against the forces of Prussia and other German States and of the rebellious duchies, terminated in 1851, Prussia having abandoned the cause of the duchies, and Austria and Prussia having intervened to restore the former order. The liberal Constitution which Christian VIII. had in the meantime granted to his subjects did not reconcile the Germans in Schleswig-Holstein.

On the death, in 1863, of Frederick VII., Christian of Schleswig-Holstein-Sonderburg-Glücksburg ascended the throne under the title of Christian IX. (q.v.) in conformity with the act known as the Treaty of London (1852), by which the European Powers had settled the succession to the Danish crown on him and his descendants by his wife, Princess Louise of Hesse-Cassel, niece of King Christian VIII. of Denmark. With Frederick VII. the direct Oldenburg line had expired, and at his death the question of the succession to the duchies acquired an importance which it had never before possessed. Schleswig and Holstein declared for Prince Frederick of Augustenburg, a scion of a branch of the Oldenburg line, and appealed to the Germanic Confederation for support. The Germanic Diet sent an army into Holstein. Prussia and Austria had in the meantime concerted with each other to take the settlement of the Schleswig-Holstein affair into their own hands. Christian VIII., reflecting upon the way in which the cause of the duchies had been betrayed by the German powers in the war of 1848-51, and relying upon the support of England, allowed himself to be dragged into a war single-handed with Prussia and Austria, whose forces advanced into Schleswig in February, 1864. After a brave but utterly futile attempt at resistance, the Danes saw their country overrun by the troops of Prussia and Austria, and by the Treaty of Vienna (October 30, 1864) were forced to submit to the terms exacted by their powerful foes, and resign not only Holstein and Lauenburg, but the ancient crown appanage of Schleswig into the hands of the two Powers. As a result of the war of 1866, the duchies became permanently possessions of Prussia. The record of political occurrences in Denmark after 1864 was mainly concerned with the struggle between the Conservative and Liberal parties, the rise of a powerful Democratic party, and the development of the system of parliamentary government. In 1904 a special minister for Iceland resident at Reikjavik was created. On January 29, 1906, the aged Christian IX. died. He was succeeded by his son Frederick VIII. (q.v.), whose second son Charles had been elected in the preceding year to the throne of Norway, as Haakon VII.

BIBLIOGRAPHY. Otté, *Denmark and Iceland* (London, 1881): Frisch, *Schweden, Norwegen, und Dänemark* (7th ed., by Jonas, Berlin, 1886): Weitemeyer (editor), *Denmark: Its History and Topography, Language, Literature, Fine Arts, Social Life, and Finance* (London, 1891); Dahlmann, *Geschichte von Dänemark* (3 vols., Hamburg, 1840-43), vol. iv., by Schäfer (Gotha, 1893), the standard history of Denmark; Philippi, *Geschichte von Dänemark* (2d ed., Leipzig, 1846); Worsaae, *The Danish Conquest of England and Normandy* (Copenhagen, 1863); Sidgwick, *The Story of Denmark* (London, 1885). See ARMED NEUTRALITY; CONTINENTAL SYSTEM; NELSON; POLITICAL PARTIES, paragraph *Denmark;* SCHLESWIG-HOLSTEIN.

DEN'NER, BALTHASAR (1685-1749). A German portrait-painter. He was born at Altona, and studied there and in Danzig, and afterwards at the Berlin Academy. He is said to have painted good portraits when only fourteen years of age. Rapidly acquiring reputation, he was invited to several European courts, and painted the portraits of many princes and other distinguished persons of his time. His chief peculiarity consisted in the fineness of his mechanical finish, which extended to depicting even the almost invisible furze of hair growing on smooth skin. He is particularly noted for his heads of old men and women. Charles VI. paid 4700 florins for a "Head of an Old Woman" by this artist. This and its companion piece, the "Head of an Old Man," are in the Museum of Fine Arts in Vienna. Specimens of his art are to be found in the principal galleries in Europe.

DENNERY, dĕ'n'-rĕ', or **D'ENNERY**, ADOLPHE PHILIPPE (1811-99). A French dramatist of versatile facility, born in Paris. He wrote or collaborated in nearly two hundred plays. The more noteworthy of his dramas are: *L'honneur de ma fille* (1835); *La perle de Savoie* (1842); *Marie Jeanne* (1845); and *Les deux orphelines* (1873), which as *The Two Orphans*, played for many years by Kate Claxton, has been exceedingly popular in the United States.

DENNEWITZ, dĕn'ne-vĕts. A small village in the Province of Brandenburg, Prussia, 42 miles south-southwest of Berlin. Here was fought, on September 6, 1813, a battle between 70,000 French, Saxons, and Poles, commanded by Marshal Ney, and 50,000 Prussians, under Generals Bülow and Tauenzin. The fighting was obstinate to the last degree, and both armies more than once drove each other from their positions. Ney's army was finally defeated. The French lost 15,000 killed, wounded, and prisoners, and 43 pieces of cannon. The Prussians lost about 9000. The most important feature of this victory to the Prussians was that most of their troops were *Landwehr* (militia), for whom Napoleon had expressed the utmost contempt, designating them as 'rabble.'

DEN'NIE, JOSEPH (1768-1812). An American journalist, born in Boston, Mass. He graduated at Harvard in 1790, studied law at Charlestown, N. H., and was admitted to the bar. From 1795 he devoted himself mainly to literature and journalism. He edited *The Farmer's Weekly Museum*, in Walpole, N. H., one of the first experiments in departmental journalism. He attained considerable reputation also as an essayist through *The Lay Preacher* (1796). In 1798 Dennie was nominated for Congress, but was defeated, and afterwards went to Philadelphia as private secretary to Timothy Pickering, then Secretary of State (1799). Here he edited *The United States Gazette*, and afterwards established and conducted until his death *The Portfolio* (1801). This weekly became a monthly in 1806, and enjoyed high reputation. Its contributors included Brockden Brown and J. Q. Adams. Dennie wrote under the pseudonym of Oliver Old School, and he performed some service in keeping the cause of letters alive in America at a very gloomy period. His Addisonian compositions have long remained unread, but his *Portfolio* is of considerable value to students of the period.

DEN'NIS, James Shepherd (1842—). An American Presbyterian missionary. He was born at Newark, N. J., graduated at Princeton College in 1863, and Theological Seminary in 1867, and was missionary in Syria from 1868 to 1891, during which time he was principal and professor of theology in the theological seminary in Beyrout (1873-91). Besides several theological treatises in Arabic, he has published *Foreign Missions After a Century* (New York, 1893); the very elaborate work, *Christian Missions and Social Progress* (vol. i., 1897, vol. ii., 1899; to be finished in 3 vols.); and *Centennial Survey of Foreign Missions* (1902).

DENNIS, John (1657-1734). An English critic and dramatist. He was born in London, and graduated at Cambridge in 1679. After further study and foreign travel, he devoted himself to literature. His play, *Liberty Asserted* (1704), was received with some favor. He was best known, however, as a political and critical pamphleteer and satirist. He is one of the best-abused men in English literature. Swift lampooned him, and Pope assailed him in the *Essay on Criticism*, and finally "damned him to everlasting fame" in the *Dunciad*. Of his critical writings, the chief is *The Advancement and Reformation of Modern Poetry* (1701).

DEN'NISON. A village in Tuscarawas County, Ohio, 100 miles northeast of Columbus, on the Pittsburg, Cincinnati, Chicago and St. Louis Railroad (Map: Ohio, H 5). It has railway workshops. Under the Ohio code in 1902, the government of Dennison is vested in a mayor and a unicameral council. Population, 1900, 3763.

DENNISON, Henry Willard (1846—). An American jurist, born in Guildhall, Vt., and educated in the Lancaster (N. H.) Academy and the Columbian Law College, Washington. In 1869 he was appointed United States vice-consul to Kanagawa, Japan, and in 1880 left the consular service to become the legal adviser of the Japan Foreign Office. He was prominent at Portsmouth in 1905 as the representative of Japan in the drafting of the peace treaty with Russia. He became a member of the Permanent Court of Arbitration of The Hague and of the Paris Association de Législation Comparée.

DENNISON, William (1815-82). An American politician. He was born in Cincinnati, graduated at Miami University in 1835, and practiced law until 1848, when he was elected to the State Legislature. He was Governor of Ohio from 1860 to 1864, and at one time, in answer to a call for 11,000 troops, raised more than 30,000. From 1864 until his resignation in 1866, he was Postmaster-General in the Cabinets of Presidents Lincoln and Johnson. He was one of the earliest of the politicians of prominence who joined the Republican Party, and in 1864 was chairman of the Republican National Convention.

DENON, de-nôɴ' Dominique Vivant, Baron (1747-1825). A French artist and author, born at Chalons-sur-Saône. At an early period he devoted himself to the study of fine arts in Paris, and became a great favorite in aristocratic society. Louis XV. made him an attaché to the embassy at St. Petersburg, and afterwards Ambassador to Switzerland. Here he repeatedly visited Voltaire at Ferney, and painted his portrait and the well-known "Déjeûner de Ferney." During his seven years' stay with the French embassy in Naples, he resolved to devote himself to art exclusively, more especially to engraving on copper. In conjunction with the Abbé Saint-Non, he published the *Voyage pittoresque de Naples et de Sicile* (1788). He returned to France during the Revolution. He was chosen by Napoleon to accompany the expedition to Egypt, in the capacity of a savant. In 1802 he published his *Voyage dans la Basse et la Haute Egypte*, the engravings attached to which are very correct. As a member of the Egyptian Institution, he had also an important part in its *Description de l'Egypte*. Napoleon now made him inspector-general of museums, in which capacity he showed great ability. He accompanied the Emperor on various subsequent expeditions, and suggested to him what art treasures of the conquered cities would be most suitable for the Louvre. After 1815 he was dismissed from his office. The remaining years of his life were occupied in preparing for publication a history of art, to be illustrated by the best artists, but he did not live to finish it. The work, however, was completed by Amaury Duval, and published in 1829, under the title *Monuments des arts du dessin chez les peuples tant anciens que modernes*. Denon himself executed more than 300 etchings. Consult La Fizelière, *L'œuvre originale de Vivant Denon* (Paris, 1872-73).

DENOTATION (from Lat. *denotare*, to mark out, from *de-* + *nota*, mark). In logic, the totality of objects to which any term with a definite meaning can be applied. Thus, every individual horse, past, present, and to come, is part of the denotation of the term horse. Denotation and connotation (q.v.) are said to vary inversely, because, in general, with the increase of attributes in the connotation, the objects in the denotation are reduced. Synonyms of denotation are extension, sphere, breadth. See Logic.

DÉNOUEMENT, dā'nōō'mäɴ' (Fr., an unknotting). In fiction, a term generally applied to the termination or catastrophe of a play or romance; but, more strictly speaking, it designates the train of circumstances solving the plot, and hastening the catastrophe. A good dénouement in a novel or play should be natural, as a result of the preceding plot, and yet should not be so obvious as to be easily anticipated.

DENS, Peter (1690-1775). A Roman Catholic theologian, born at Boom, in Belgium. The scanty information we possess about Dens is derived from the epitaph inscribed on his tomb. From this epitaph it appears that he was reader in theology at Mechlin for twelve years, and president of the College of Mechlin for forty years. He was also canon, penitentiary, synodical examiner, and scholastic archpriest of Saint Rombold's—the metropolitan church of Belgium. The work which has rendered Dens's name familiar even to the Protestant public is his *Theologia Moralis et Dogmatica* (new ed., 8 vols., Dublin, 1832). It is a systematic exposition and defense—in the form of a catechism—of every point of ethics and doctrine maintained by Roman Catholics, and has been extensively adopted as a text-book in their colleges. The casuistical parts of the work have been severely criticised by Protestant moralists, and were translated in a condensed form by J. F. Berg (Philadelphia, 1840).

DENSITY. See SPECIFIC GRAVITY; MOLECULES—MOLECULAR WEIGHTS; VAPOR.

DENT, FREDERICK TRACY (1820-92). An American soldier, born in White Haven, Mo. He graduated at West Point in 1843, was assigned as brevet second lieutenant to the Sixth Infantry, served in the Southern campaign during the Mexican War, and was brevetted first lieutenant and captain for gallant and meritorious conduct in the battles of Contreras and Churubusco, and in the battle of Molino del Rey, respectively. He subsequently served for sixteen years on frontier duty, taking part in the Yakima expedition; was promoted to be major in March, 1863, and was stationed in New York to suppress anticipated riots in 1863. In 1865 he was brevetted brigadier-general of volunteers for gallant and meritorious services, and in 1866 was made brigadier-general of volunteers. In 1873 he served on the staff of the general-in-chief; was in command of Fort Trumbull, Conn., in 1875, and of the post of Saint Augustine in 1881.

DENTAL FORMULA. A formal statement of the number and arrangement of the teeth. See TEETH.

DENTALS (Neo-Lat. *dentalis*, from Lat. *dens*, tooth). A name given to the sounds represented by the letters *t, d, th*, as made by the tongue against the teeth..

DENTA′TUS, MANIUS CURIUS. A Roman eminent for his warlike exploits and the republican simplicity of his fashion of life. He was three times consul. During his first incumbency, he triumphed over the Samnites and the Sabines, and during his second (B.C. 275), defeated Pyrrhus, near Beneventum, and drove him from Italy. In B.C. 272 he became censor. It is related that on one occasion a Sabine embassy, sent to his farm with gifts, found him roasting turnips at the hearth. Rejecting the gifts, he declared that he preferred rather to rule those possessing gold than himself to possess it. He is often referred to by later writers as a citizen of the old school. It was he who dug the canal from Lake Velinus to the River Nera, where it falls in the well-known cascade of Terni.

DEN′TICE (Lat. *dentix*, a kind of sea-fish; from *dens*, tooth, on account of its voraciousness). A fish of the genus Dentex, family Sparidæ (sea-breams, etc.), having a deep, compressed body, and generally perch-like form; a single dorsal fin, the anterior rays of which are spinous: scaly cheeks: and large canine teeth. One species (*Dentex vulgaris*), 'dentix' of the ancient Romans, abounds in the Mediterranean, and attains 20 to 30 pounds weight. It is excessively voracious, devouring other fishes: but is itself in much request as an article of human food, and great numbers are taken in southern Italy, and in Dalmatia and the Levant, where it is a considerable article of commerce, being cut in pieces, and packed in barrels with vinegar and spices as well as served fresh.

DENTIFRICE, dĕn′tĭ-frĭs (Lat. *dentifricium*, tooth-powder, from *dens*, tooth + *fricarc*, to rub). Any substance, generally a powder, which is employed as an aid in cleaning the teeth. Charcoal and cuttlefish-bone powder are useful as detergents; chalk, as a soft powder; and pumice, as a hard, gritty substance for occasional use, when the teeth are more than ordinarily colored. Catechu, cinchona, and rhatany are employed to give astringency to the tooth-powder; myrrh, to impart odor; and bole armeniac, to communicate a red color. Common salt, cream of tartar, phosphate of soda, and sulphate of potash are occasionally used; and where the breath has an unpleasant odor, the addition of four parts of bleaching-powder (chloride of lime) to 100 of the tooth-powder removes the fetid character of the breath, and also tends to whiten the teeth. An excellent mouth-wash may be prepared by adding to a tumblerful of water 10 or 15 drops of a mixture containing equal parts of carbolic acid and essence of peppermint.

DENTILS (Lat. *denticulus*, dimin. of *dens*, tooth). A series of small blocks, arranged in a row at regular intervals, especially under the corona in a classical cornice. They are used in the Greek, Ionic, and Corinthian orders, and by the Romans also in the Doric and Composite orders. See ENTABLATURE.

DENTINE, dĕn′tĭn (Fr., from Lat. *dens*, Engl. *tooth*). The tissue forming the principal mass of the teeth. It is a modification of osseous tissue, but differs from this in structure and chemical composition. Microscopical examination shows numerous minute branching tubules imbedded in a dense intertubular substance, and opening into the cavity of the tooth, which contains the pulp. Externally, the crown of the tooth is covered by a thin layer of enamel, which is extremely hard and compact.

DENTIROSTRES, dĕn′tĭ-rŏs′trēz (pl. of Neo-Lat. *dentirostris*, from Lat. *dens*, Engl. *tooth* + *rostrum*, beak, bill). A term no longer in use, formerly designating an artificial group of birds, mostly insectivorous, having a notch and 'tooth' in the margin of the upper mandible.

DENTISTRY. The science of diseases or lesions of the teeth and adjacent organs, and the art of making and inserting appliances for the correction of loss, deformity, injury, or malposition of those organs. The two main branches of dentistry are prosthetic or mechanical dentistry, sometimes called prosthodontia, and operative or surgical dentistry. It is not easy to draw a distinct line of demarcation between these two branches, for much of the work considered to be in the province of the operative department is really prosthetic or mechanical. and vise versa. Prosthesis in its surgical sense has been defined to be 'the addition of an artificial part to supply a defect of the body.' Many of the conditions about the mouth which call for treatment require on the part of the dentist an intimate knowledge of both branches, and the treatment is both prosthetic and operative. The operation of filling teeth, and also the insertion of inlays, although generally considered as belonging to the department of operative dentistry, are to a certain extent prosthetic, since they supply artificial substitutes for lost natural parts. Under the head of operative dentistry would come also the operations of extracting teeth, implantation, replantation, transplantation (see below), removal of deposits from about the teeth, and the treatment of the various diseases or injuries of the dental organs or their surroundings. The making of artificial dentures, crowns, bridgework, obturators, and artificial vela is prosthetic; but the adjustment of such appliances, or perhaps the preliminary treatment, may require no small amount of surgical knowledge and skill. The operative dentist must also to a certain extent be qualified as an oral surgeon, in order that he may treat some of the ordinary diseases or injuries which may affect the mouth or maxillary bones. The correction of irregularities of teeth and the making of appliances for the purpose are largely mechanical, and for that reason usually classed under the head of prosthetic dentistry. Strictly speaking, however, the operation is not a prosthetic one, and many prefer to class this as a third branch or subdivision of dentistry, calling it *orthodontia*, and the operator an 'orthodontist.' Since the duties of the dentist include operations not only upon the teeth, but also upon their surroundings in and about the buccal cavity, many are in favor of applying to dentistry the more comprehensive name *stomatology*, which means 'the science of the mouth.'

As a distinct profession, dentistry has only developed during the past century. Prior to that period, so far as we can determine, it existed only as a somewhat unimportant branch of the healing art; and some of the operations now considered to belong only to the domain of dentistry were then performed by the medical practitioner, or perhaps by some artisan who made claim to a certain amount of proficiency in the performance of such operations. The time is not so long passed as to be beyond the recollection of some of the dental practitioners now living when it was perfectly lawful and permissible for the barber or blacksmith to perform the operation of extracting human teeth, and to receive a fee or award therefor, and also when it was customary for the silversmith or jeweler to make artificial dentures.

Certain branches of dentistry were practiced long before the modern profession came into existence, and dental operations were performed at a very early date in the history of civilized nations. The Romans probably acquired their dental knowledge from the Etruscans, and the Etruscans and Greeks from the Egyptians. Specimens of dental work in the shape of natural teeth bound together with gold, or artificial teeth of ivory, bone, wood or stone, attached to the natural ones by means of cord, or gold or silver bands or ligatures, have been found in the jaws of mummies, which were probably buried five or six hundred years before the Christian Era; but so far as we know at present, there are no authentic examples of tooth-filling of equal antiquity. In writings upon the subject of dentistry, the statement is not infrequently made that teeth of mummies have been found filled with gold. But, according to the researches of Van Mater and others, the truth of such statements is certainly to be questioned. Van Mater, who had unusually good opportunities for archæological investigation, asserts that in his careful study of the teeth of many of the remains taken directly from excavations of ancient tombs in Italy, and also of the teeth of mummies in various museums and private collections, he was unable to find a single example of a gold filling in such teeth. The results of his investigations seem to show that cases hitherto supposed to be examples of gold filling were nothing more or less than specimens of bridge-work, or perhaps the banding of teeth with gold for the support of loose ones, or to hold artificial teeth in place. Many of the specimens found were so covered with the accumulated dust of centuries that it was impossible, before removing some of that accumulation, to tell whether they were examples of gold fillings in the teeth, or gold bands about the teeth. It is well known that the higher orders of Egyptians often caused the mummies of their deceased friends and relatives to be lavishly decorated with paint and gilding, and in several instances the supposed gold fillings in the mouths of Egyptian mummies have, on mere scratching with a knife, proved to be nothing but superficial gilding on the natural teeth.

References to dental operations are found in the writings of Herodotus and Hippocrates in the fifth century B.C. Aristotle wrote on this subject about B.C. 350, and Heraclides of Tarentum, Herophilus, and Erasistratus are recorded as dental operators, three centuries before our era. According to the writings of C. Aurelinus, Erasistratus deposited in the temple of the Delphian Apollo a leaden 'odontogogue' (forceps), "to prove that (only) those teeth ought to be removed which are loose or relaxed, and for which a leaden instrument will suffice." Celsus, who lived about B.C. 100, was the first to recommend the use of the file in the mouth; saying that the points of a decayed tooth, which hurt the tongue, should be removed with an iron file. Horace (B.C. 65 to 8), Ovid B.C. 43 to A.D 17 or 18), Martial (c.43-104 A.D.), and other of the ancient Greek and Latin poets, allude in their writings to artificial teeth, as does Cicero. The further history of dentistry is meagre and uncertain. Before the invention of printing, the methods of recording and transmitting knowledge were so laborious and expensive that only matters of great importance were transcribed, while other matters, of lesser importance, were transmitted and preserved only by word of mouth. It is owing to these conditions that the early history of the profession is so imperfect and uncertain. The oldest printed book known to dental bibliography is one dated 1532, printed in German by Peter Jordan, and containing extracts or quotations from the works of Galen, Avicenna, Mesue, Cornelius, Pliny, and others. This book was written for lay readers, by an anonymous writer, and in the chapter treating of decay of the teeth, the author, quoting from Mesue, advises, as one method of treatment, first to scratch and clean with a fine chisel, knife, file, or any other suitable instrument, the parts attacked, and then to fill the cavity with gold leaves for the preservation of the remaining parts of the tooth. If this quotation is reliable, the operation of filling teeth with gold must have been known more than a thousand years ago. Galen (A.D. 150) treated the subject of the teeth more extensively than any other of the ancient authors, and his writings on that topic were the best up to the time of Fallopius, Eustachius, and Ambroise Paré, in the sixteenth century. Fauchard wrote on dentistry in 1728, and Bourdet in 1757. John Hunter in 1771 published his *Treatise on the Natural History of the Human Teeth,* and in 1778 *A Practical Treatise on Diseases of the Teeth,* as a supplement to his former work. Not being a dental specialist, however, he wrote anatomically and philosophically, rather than practically. Woofendale's *Practical Observations on the Human Teeth* were published in London in 1783. Blake wrote on dentistry in 1798 or 1801. Since the beginning of the nineteenth century a considerable amount of original research has been carried on in all branches of dental science. and a large and increasing number of treatises have been devoted to dentistry exclusively.

HISTOLOGY AND DEVELOPMENT. The microscope has done much to improve the practice of modern dentistry. Leeuwenhoek was the first to give an intelligent idea of the histological structure of the teeth (c.1682). The main work, however, on the embryology, histology, and pathology of the teeth, was done during the nineteenth century. The first rational theory of the evolution of the teeth was advanced by Goodsir in 1837. In 1860 Robin and Magitot brought forth a better theory in regard to the mode of development of the teeth, and their theory, with very little modification, is accepted at the present time. See TEETH.

ARTIFICIAL DENTURES. Prior to the discovery of the method of making porcelain teeth, the dentist made use of human teeth, animal teeth (those of cattle and sheep), hippopotamus tusks, elephant and other ivories, and bone. The human and animal teeth were fastened in the mouth by ligatures of gold or silver wire, unbleached thread, sea-grass, or silkworm gut. The hippopotamus or elephant ivory, or the common bone, was carved in single teeth or blocks, and perhaps in the shape of full or partial dentures, to replace the lost natural teeth. The objections to this method of restoration were the difficulty of getting accurate adaptation in the mouth, and the tendency, because of the porosity of the material, to absorb moisture, to become offensive, and ultimately to decay. The use of porcelain as a material for artificial teeth was first proposed by Fauchard in 1728; but the manufacture of porcelain teeth was first actually begun by Duchateau, a French chemist, assisted by Dubois, a dentist of Paris, somewhere between 1774 and 1776. The date of the introduction of *metal bases* in prosthetic dentistry is not definitely known. It is believed, however, that gold was the first metal used as a base for artificial teeth, and that Dr. Gardette, of Philadelphia, was the first to use the gold base in this country, in or before 1787. Among the other metals which have been used as bases for artificial dentures are silver, platinum, aluminum, tin, and various metallic alloys; but at the present time gold and platinum are the only metals in general use for that purpose. *Gutta percha* as a base was introduced in England by Edwin Trueman, about 1851. In 1851, also, Nelson Goodyear discovered a method of making a hard rubber compound, since named *vulcanite,* and in 1855 Charles Goodyear, Jr., obtained a patent in England for making a dental plate of hard rubber, in which the teeth were secured before the compound was vulcanized. *Rose-pearl,* a preparation of collodion, was next experimented with as a base, but, owing to the difficulty of manipulating it, and to its lack of durability, it fell into disuse. *Celluloid* was the next material tried, but, being more porous and less durable than vulcanite, it is seldom used at present. *Porcelain* and a combination of platinum and porcelain have been used as bases for artificial dentures. Porcelain alone did not come into general use because of the difficulty of manufacture, brittleness, and danger of shrinkage or warping during the process of firing. The combination of *porcelain and platinum* (continuous gum) is made as follows: A base of platinum is swaged to fit the mouth, the artificial teeth are lined with metal and soldered to the platinum base; a porcelain body of the proper shade is next molded about the necks and root portion of the artificial teeth, as well as upon the exposed surfaces of the platinum, and carved and colored to imitate the natural mucous membrane of the mouth; the entire piece is then put in an oven and baked long enough and often enough to fuse the porcelain properly. This method of inserting artificial teeth is one of the best at our command, so far as beauty, cleanliness, durability, and correct imitation of nature are concerned.

CROWN AND BRIDGE WORK. Modern bridgework (or the insertion of artificial teeth by means of bands, springs, or artificial crowns attached to the crowns or roots of natural teeth) is but a modification of methods pursued by the ancients many centuries before the Christian Era. The use of bridges is not infrequently carried to extremes, and bulky bridges are sometimes attached to teeth which are incapable of bearing the strain for any length of time. Poorly made or improperly adapted bridges are frequently inserted, and are prolific sources of pollution of the secretions of the mouth; and some cases of movable or immovable bridges require considerable sacrifice of natural tooth structure, or perhaps devitalization of the pulp, in order that the bridge may be properly adjusted. It is sometimes a difficult matter to determine the best means of restoration or prosthesis in these cases, but the conservative dentist will hesitate, and perhaps prefer a partial denture, rather than resort to the sacrifice of those tissues for the sake of introducing a bridge.

Gold shell crowns, for the purpose of covering teeth too badly broken down to be amenable to the operation of filling, are supposed to be of quite recent invention, but it is claimed that their use was suggested by M. Mouton, of Paris, as far back as 1746. It is said also that Mouton advised enameling the exposed surfaces of such crowns. Gold crown-work has been abused even more than bridge-work, and we frequently find gold crowns placed on the anterior teeth to protect them when injured or diseased, or to serve as abutments for bridges when crowns of porcelain or porcelain-faced crowns would answer the purpose as well, and be much more sightly. Many patients will insist on a dentist placing a gold cap or shell crown on a tooth, when a filling of some sort would be very much better and much more artistic. Fortunately, the laity, as well as the dentist, are beginning to appreciate the enormity of this offense against good taste.

FILLINGS, ETC. The filling of teeth is now sometimes called *obturation.* Before the introduction of gold, lead foil was used as the material for filling teeth. Celsus (B.C. 100) is sometimes referred to as the first to have advised filling cavities in teeth; but the only reference to the subject in his works is his recommendation to stuff with lead decayed and frail teeth that are to be extracted, in order that they may not break under the forceps. Tooth-filling proper was, up to the beginning of the nineteenth century, practiced very seldom. The operation of filling teeth with *gold* was mentioned by Fauchard in 1785. For years gold was used in the form of thin foil or rolled gold of the noncohesive variety. Sponge or crystal gold was introduced in 1846, but was little used until its application to dental purposes was patented, and its working quality improved by A. J. Watt, of Utica, N. Y., in 1853. In 1855 Dr. Arthur, of Baltimore, recommended the use of cohesive gold for filling teeth, and this variety is more used at present than any other. The use of mallet force in filling teeth with gold was first recommended by Dr. William H. Atkinson, of New York. *Platinum* has been tried as a filling material, but was found to be too harsh, and to have too little ductility and plasticity to make it valuable for that purpose. It is sometimes used in combination with gold foil or rolled gold for a filling exposed to severe stress. *Silver* is not used alone for fillings, because of its tendency to oxidize, and because of its stiffness and want of ductility. *Tin,* in the form of foil, has been used for filling teeth since 1783, and is still used for certain kinds of cavities. The advantages of tin are that it is soft, pliable, easily condensed and adapted to cavity walls, a poor conductor of heat, and, in cases of disintegration, yields salts that seem to possess antiseptic properties. Yet its softness, its almost complete lack of cohesiveness, its property of becoming discolored in the mouth, and its disintegration under chemical and mechanical influences, also constitute serious disadvantages.

Owing to the difficulties in properly manipulating the simple metals in filling teeth, efforts were early made toward discovering some material of greater adaptability, and, as a result, we have the plastics so extensively used at the present day. The earliest of these materials were preparations of the gum resins, such as ethereal or alcoholic solutions of mastic, sandarac, damar, or copal. Then fusible metals were employed, until, in 1826 or thereabouts, Taveau, of Paris, introduced the use of *amalgams*. An amalgam is a combination of one or more metals with mercury, and that first tried was an amalgam of pure silver. The next amalgam to be used was one of coin-silver. The amalgams as made at present usually consist of a combination of three or more metals with mercury. Such amalgams, manipulated by improved modern methods, constitute the only plastics that can be considered as permanent filling materials. The other plastics used at present include: Gutta-percha (introduced in 1847-48); 'Hill's stopping' (a mixture of gutta-percha with harder materials); oxy-chloride of zinc (oxide of zinc, with a solution of zinc chloride); zinc phosphate (oxide of zinc, with a solution of phosphoric acid); oxy-phosphate of copper; aluminum phosphate; oxy-sulphate of zinc; and other varieties of the cements. Each of these cements has its definite uses and advantages, but all have the disadvantage of serving only as temporary fillings.

The *filling of pulp-canals* in devitalized teeth was believed to have been introduced by Maynard and Baker, of Washington, D. C. It has been shown, however, that this operation was practiced by Bourdet and Fauchard, in Paris, as far back as the middle of the eighteenth century; and, according to Bourdet, had been practiced by others many years before. The *capping* (covering over) *of exposed pulps* is said to have been first recommended by Koecker. The *dental engine,* in its original form, was introduced by Dr. Morrison, of Saint Louis, Mo., in 1846; in its various improved forms, it has become one of the most useful of dental appliances. The use of the *rubber dam* for the purpose of excluding moisture from cavities during the operation of filling teeth was first suggested by Dr. S. C. Barnum, of New York, and this innovation has been as great a boon to dentistry as the introduction of the Esmarck bandage has been to general surgery.

INLAY WORK. One of the latest innovations in the art of dentistry is inlay work, i. e. the use of plugs of porcelain, glass, gold, vulcanized rubber, and similar materials, which are cemented into a tooth-cavity in such form and shape as to fit it exactly. With the improved methods and materials for making porcelain inlays, this mode of filling carious cavities is becoming more and more popular, and when perfected will undoubtedly cause the abolition of gold fillings in the anterior teeth. It may be interesting to observe that inlays of green jade, placed in the teeth probably for ornamentation, have been found in the ruins of Copan, Honduras, and of Yucatan.

USES OF ELECTRICITY. Electricity has its practical applications in dentistry as well as in the arts, and is utilized not only for the control of various mechanical appliances employed by the operative and prosthetic dentist, but in the form of the electric mouth-lamp, the cataphoric current, etc., is used for diagnostic and therapeutic purposes as well. *Cataphoresis,* or the method of forcing drugs into the tissues by means of the galvanic current, was first proposed by Dr. B. W. Richardson as far back as 1857, but has come into general use only within recent years. The X-rays, or Roentgen rays, are now put to practical use in dental as well as in general surgery, and as a means of diagnosis are sometimes of very great assistance. For the purpose of detecting unerupted or impacted teeth, abnormal growths on or about the teeth, imperfect root-canal fillings, resorption of roots, fractures of the jaw, or the presence of foreign bodies in the alveoli of the teeth, the X-rays are of great value and frequently utilized.

TREATMENT OF LOOSE TEETH. The teeth frequently become loosened from their attachments in consequence of local or constitutional disturbances, and the treatment of this condition is still a somewhat knotty problem. When due to local causes, such as deposits of salivary calculus, or ordinary tartar, the treatment is principally local, and consists in first removing the deposits, getting the teeth as smooth as possible, and then adopting proper therapeutic and prophylactic measures, with a view to inducing a healthy condition of the soft tissues and preventing a return of the deposit. The constitutional cause, which is more often concerned than any other in bringing about the loosening of teeth, is the so-called 'gouty' or 'rheumatic' condition.

In cases of this nature, the treatment should be both local and constitutional or general.

REPLANTATION; TRANSPLANTATION; IMPLANTATION. *Replantation*, or the replacing of a natural tooth in the socket from which it has been extracted, or forced out, is a very old operation, and its definite history is unknown. *Transplantation*, or the placing of a natural tooth in a natural socket other than the one it originally occupied, is also an old operation, and was spoken of by Ambroise Paré in the sixteenth century. In this operation, it was customary to use a freshly extracted tooth from the mouth of one person and place it in the socket of a newly extracted tooth in the mouth of another. In an advertisement inserted in a Philadelphia paper in 1784, Le Mayeur, a dentist, offers two guineas each for sound teeth to be obtained from "persons disposed to sell their front teeth, or any of them." *Implantation*, which may be defined to be the placing of a natural or artificial tooth in an artificially prepared socket, or the insertion of an artificial tooth in a natural socket, was suggested by Dr. William Younger, of San Francisco, Cal., in 1885; but it is asserted that Bourdet, in 1780, advised a similar operation. In the Peabody Museum, at Cambridge, Mass., there is a jaw, discovered in the ruins of Copan, Honduras, wherein is implanted (in the socket of a left lower lateral incisor) an artificial tooth of carved stone, which from the amount of tartar on it would indicate a considerable amount of use in the mouth of the individual. The exact age of those ruins is unknown, but this specimen of implantation probably antedates Dr. Younger's operation by about 1500 years. Experience has shown that implanted teeth are short-lived, so far as their usefulness goes. After a period varying from two to ten or twelve years, the implanted teeth almost invariably loosen and fall out, because of absorption of the roots when natural teeth are used, and incompatibility when artificial roots are inserted. In many cases of implantation, the operation is unsuccessful from the start, and no union is obtained; in others, a slight attachment seems to occur between the tooth and alveolus, which gives out after a few weeks or months; while in a fair percentage of cases the teeth may become firmly attached and remain for several years. As a rule, they seldom remain longer than three or four years, and are much shorter-lived than replanted or transplanted teeth.

ANÆSTHETICS. The action and history of the use of anæsthetics may be found described in the general article ANÆSTHETIC, and in a number of special articles on the more important anæsthetic substances in use at present. Here it may be stated that, while chloroform and ether were much used in dentistry formerly, practically the only general anæsthetic employed by dentists at present is nitrous oxide, or 'laughing-gas.' The only local anæsthetic now used in dentistry to any extent is cocaine, which has almost entirely superseded the use of cold-producing volatile substances, like ordinary ether, ethyl, chloride, or rhigolene.

ORTHODONTIA. Orthodontia, or the art of regulating or correcting malpositions of teeth, has recently developed into a distinct specialty, although some attention has been given to it by dentists ever since the latter part of the eighteenth century. At the present time some operators devote their whole attention to this branch of practice, and the results obtained by those who have the necessary mechanical ingenuity and diagnostic ability are extremely gratifying.

DENTISTS. Woofendale, who came to America in 1766, seems to have been the first regular dental practitioner in this country. Lemaire came to this country probably in 1784. James Gardette, a native of France, commenced practice here in 1781. He went to Philadelphia in 1784, and continued in successful practice there for forty-five years. Josiah Flagg, who, as far as can now be accurately determined, was the first dentist native to this country, commenced practice in 1782. He obtained his knowledge of dentistry from Lemaire. Isaac Greenwood, the father of the John Greenwood who made sets of artificial teeth for George Washington, was probably the first dentist in Boston. John Greenwood and his younger brother, Clark, were in practice in New York about 1784. The increasing growth of the profession since 1820 is shown by the following figures: In 1820 there were about 100 dentists in the United States; in 1872 the number had increased to 5000; in 1893 the number was 13,500; in 1898, 18,000; in 1900 the number in the United States and Canada was 26,500; in 1902 the United States and Canada had over 27,600 dentists, of which number 16,390 were graduates of regular dental colleges.

LITERATURE. Marshall, *Principles and Practice of Operative Dentistry* (Philadelphia, 1901); Marshall, *A Manual of the Injuries and Diseases of the Face, Mouth, and Jaws* (Philadelphia, 1897); Richardson, *A Practical Treatise on Mechanical Dentistry*, edited by Warren (Philadelphia, 1900); Essig, *American Text-book of Prosthetic Dentistry* (Philadelphia, 1896); Gorgas, *Dental Medicine* (Philadelphia, 1901); Harris, *Dictionary of Dental Science* (Philadelphia, 1893); Garretson, *System of Oral Surgery* (Philadelphia, 1890); Kirk, *American Text-book of Operative Dentistry* (Philadelphia, 1900); Dexter, *History of Dental and Oral Science in America* (Philadelphia, 1876); Brownell, *Anatomy and Histology of the Mouth and Teeth* (2d ed., Philadelphia, 1902); Burchard, *Text-book of Dental Pathology* (2d ed., Philadelphia, 1904). See TEETH.

DENTITION. See TEETH.

DEN'TON. A city and the county-seat of Denton County, Texas, 34 miles north by east of Fort Worth, on the Missouri, Kansas and Texas and the Texas and Pacific railroads (Map: Texas, F 3). It is the seat of the North Texas State Normal School, the Girls' Industrial College of Texas, and the Southwestern Christian College. Denton does extensive trading in cotton, wheat, and cattle. It was first settled in 1857 and incorporated in 1868. Population, 1900, 4187; 1906 (local est.), 6120.

DENTON (Danetown). A manufacturing and coal-mining town in Lancashire, England, 2½ miles southwest of Ashton (Map: England, G 5). It owns remunerative municipal gasworks. Population, in 1891, 14,000; in 1901, 14,900.

D'ENTRECASTEAUX ISLANDS, däɴ'tr'-kȧs'tō' (named in honor of their discoverer, Joseph Antoine *d'Entrecasteaux*). A group of islands, about 10 miles off the southeast coast of New Guinea, lying in latitude 10° S. (Map: East India Islands, L 6). They consist of three large islands, namely, Ferguson, Normansby, and Goodenough, and a number of islets, with a total area of about 1200 square miles. They are very mountainous, some peaks attaining the height of 7000 feet. Extinct volcanoes and hot springs are found on Ferguson Island. Tin and traces of gold have been discovered. Since 1885 the group has belonged to Great Britain, forming an administrative dependency of British New Guinea. The inhabitants are Papuans.

DEN'UDA'TION. See EROSION.

DEN'VER. The largest city of Colorado, State capital, and county-seat of Denver County, at the junction of the South Platte River and Cherry Creek; 2025 miles from New York City and 1457 miles from San Francisco; in latitude 39° 47′ N., longitude 105° W. (Map: Colorado, E 2). It is one of the most important railroad centres in the West. Among the numerous lines entering the city are the Atchison, Topeka and Santa Fe; the Chicago, Burlington and Quincy; the Chicago, Rock Island and Pacific; the Colorado Midland; the Denver and Rio Grande; the Missouri Pacific; the Union Pacific; the Colorado and Southern; the Denver, Northwestern and Pacific; and the Colorado Eastern.

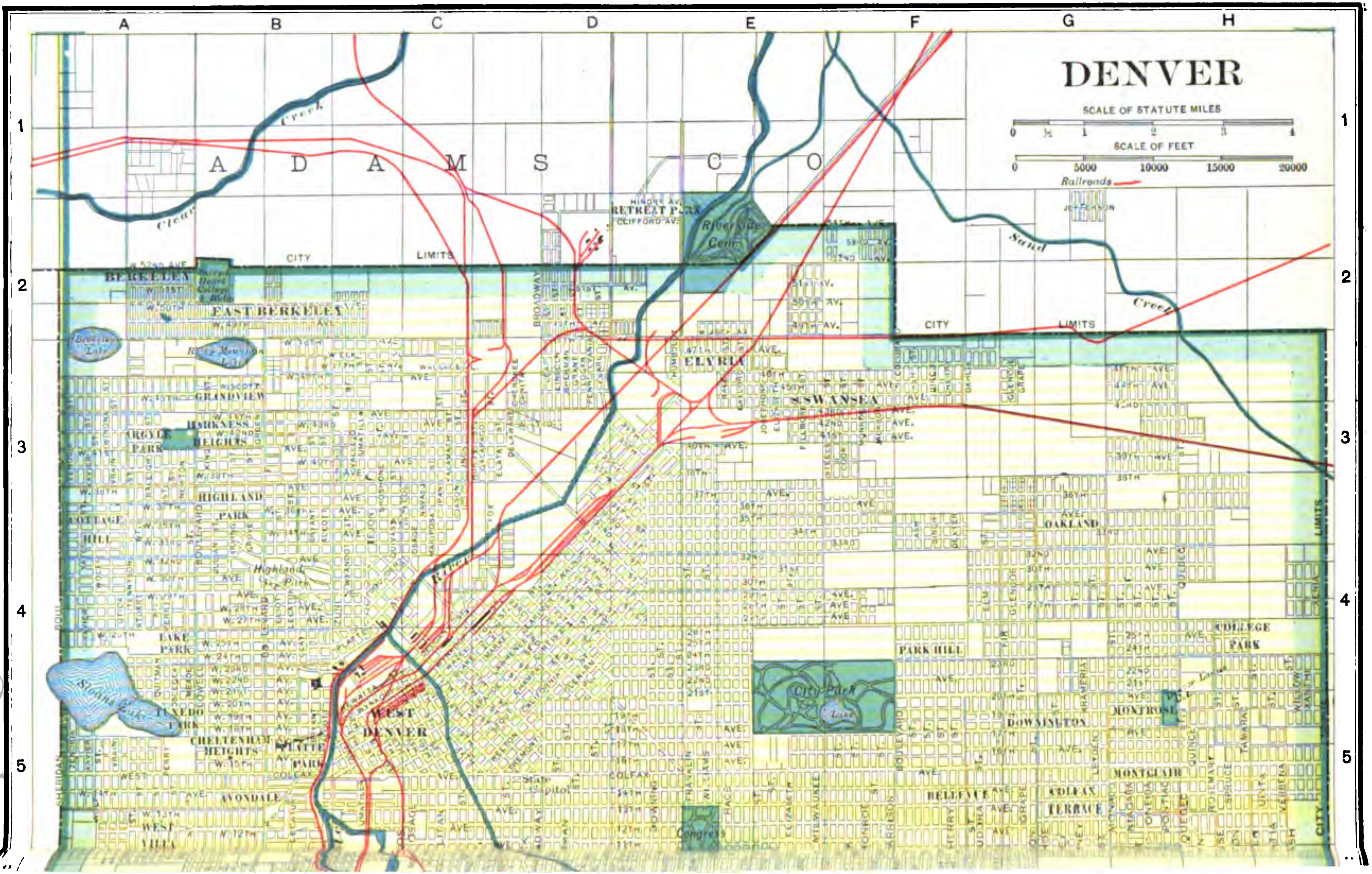
The city is magnificently situated at an altitude of 5270 feet, within 15 miles of the eastern base of the Rocky Mountains. Owing to the remarkable clearness of the atmosphere, a stretch of 200 miles of the mountains is discernible almost every day in the year. Denver has a climate peculiarly mild and adapted to people suffering with pulmonary complaints. The city is laid out regularly with broad and shaded streets, is substantially built with brick and stone, and is watered entirely by irrigation. The more important streets are asphalted, 20 miles of thoroughfares being paved in this way, while 70 miles are surfaced with disintegrated granite. Among noteworthy buildings and institutions are the Capitol on Capitol Hill, an imposing structure of Colorado granite, erected at a cost of $2,700,000; the United States custom-house and post-office; the United States mint; the county court-house; the chamber of commerce; the mining exchange; the Union Depot; University of Denver (Methodist Episcopal); College of the Sacred Heart (Roman Catholic); Trinity Methodist Episcopal Church; Brown Palace Hotel; the Tabor Opera House, and the Denver Club; Equitable Building; and Saint Anthony's, Saint Luke's, Saint Joseph's, Oakes Home, Phipp's Sanatorium, and several other hospitals and sanatoriums. The city has also theological, law, and medical colleges, a manual-training school, and a public library of 90,000 volumes, besides the State library of 15,000 volumes and numerous others. Of the 21 public parks and two children's playgrounds, with a total area of 1032 acres, the largest is City Park, a preserve of 320 acres, adorned with flowers, shrubbery, statuary, etc., and including zoölogical gardens, a natural-history museum, lakes, bicycle track, and driveways. The street railway system covers 156 miles.

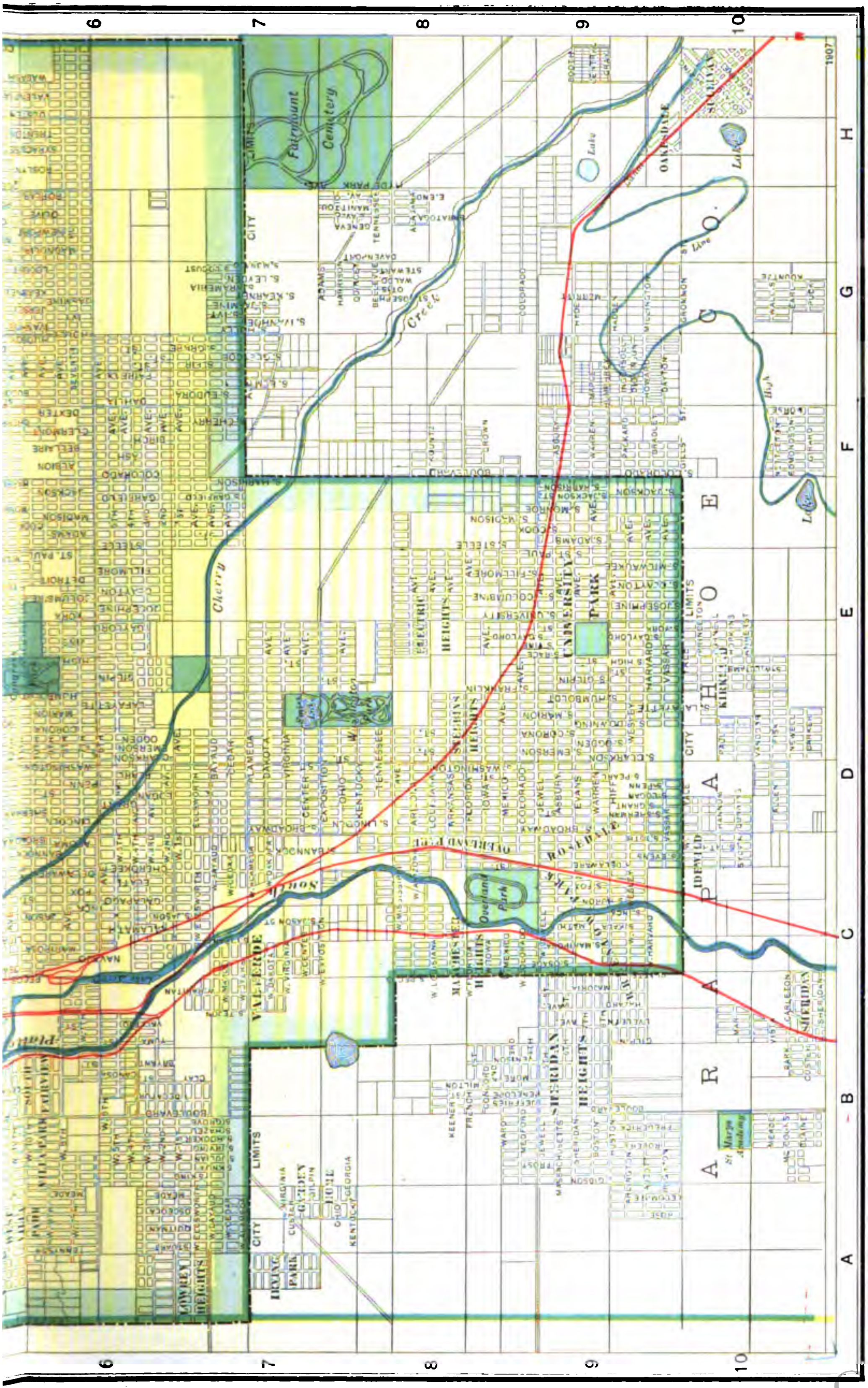
A combination of favorable natural conditions has resulted in making Denver the leading industrial city of the western mountain region of the United States. Chief of these is its proximity to the great mining region of Colorado, which produces not only metals—lead, copper, iron, gold, and silver—but also coal, the latter making it possible to smelt the ores, and thus avoid shipping to other parts for that purpose. Added to this is the convenient situation of the city for a railway centre. Sixteen lines now enter the city, making it altogether the best collecting and distributing centre in the Rocky Mountain States—the metropolis of a vast region. The great distance from the Eastern manufacturing centres exempts it largely from trade competition. The value of the manufactured products in 1905 was $36,660,410, exclusive of the smelting industry, whose products in round numbers amount to $15,000,000. After this in order of importance were foundry and machine-shop products and flouring and grist-mill products. The machinery produced consists largely of that used in mining. The manufacture of malt liquors and railroad-car construction and repairs are also considerable industries. Denver is important as a live-stock market, and as the trade centre of a tributary agricultural region. It has large wholesale interests in dry goods and groceries, its annual jobbing trade being estimated at $40,000,000. The stock-yards handled in 1906 over 1,363,798 head of stock.

The City Council is a bicameral body, constituted of 7 supervisors and 16 aldermen. The Mayor is elected for four years. The boards of public works, fire, and police, consisting of three members each, and the city attorney, receive their appointment from the Mayor. The health and the park commissions and the superintendents of street-cleaning, sprinkling, supplies, are also appointed by the Mayor. The treasurer, auditor, and clerk are elected by the people. The city has a good supply of water, which is secured from the mountain streams. The water-works are owned and operated by a private company. The net debt in 1907 was $1,079,595. The total annual income of the city is about $2,200,000, and the expenditure for maintenance and operation $2,000,000. The larger annual appropriations approximate $900,000 for schools, $275,000 for the fire department, $245,000 for the police department, $130,000 for municipal lighting, and $185,000 for parks.

Denver was first settled by miners in 1858, and in the following year was incorporated as a city by the Provisional Legislature and named in honor of Gen. J. W. Denver, then Governor of Kansas. In 1861 it was reincorporated by the first Territorial Legislature. It became the capital of the Territory in 1867, and in 1870, on the completion of the Denver Pacific and the Kansas Pacific railroads, was first connected by rail with the East and South. Destructive floods occurred in 1864 and in 1876. In 1894 the town of South Denver was annexed. Since 1870 its growth has been exceedingly rapid; a population of 4759 in that year having increased to 35,629 in 1880, 106,713 in 1890, 133,859 in 1900, including 25,300 persons of foreign birth and 3900 of negro descent, and 185,000 (local est.) in 1906.

DENVER, UNIVERSITY OF. An institution of higher education founded in 1864 at Denver, Colo., by Governor John Evans and other members of the Methodist Episcopal Church. It was known as Colorado Seminary until 1880, when it was reorganized and the present name adopted in evidence of its increased educational scope.


DENVER
SCALE OF STATUTE MILES
0 ½ 1 2 3 4
SCALE OF FEET
0 5000 10000 15000 20000
Railroads
A B C D E F G H
1 2 3 4 5
ADAMS CO
Clear Creek
Sand Creek
CITY LIMITS
RETREAT PARK
HINDRY AV.
CLIFFORD AV.
Riverside Cem.
JEFFERSON
BERKELEY
EAST BERKELEY
Regis College
Berkeley Lake
Rocky Mountain Lake
W. 52ND AVE
BROADWAY
ELYRIA
SWANSEA
GRANDVIEW
HARKNESS HEIGHTS
ARGYLE PARK
HIGHLAND PARK
COTTAGE HILL
Highland Park
LAKE PARK
Sloans Lake
TUXEDO PARK
CHELTENHAM HEIGHTS
PLATTE PARK
WEST DENVER
AVONDALE
WEST VILLA
SHERIDAN
River
State Capitol
COLFAX
City Park
Lake
Congress
OAKLAND
PARK HILL
DOWNINGTON
MONTROSE
MONTCLAIR
BELLEVUE
COLFAX TERRACE
COLLEGE PARK
WILLOW
XANTHIA



COPYRIGHT, 1907, BY DODD, MEAD & CO.

L.L. POATES ENGR G CO., N.Y.

All its degrees, aggregating 1400 in 1906, have been conferred since 1882. The university comprises six colleges and a preparatory school. The six colleges are: The College of Liberal Arts, the Graduate School, the Denver and Gross College of Medicine, the Denver Law School, the Colorado College of Dental Surgery, and the College of Music. The Iliff School of Theology, formerly a part of the university, is now independent. The university owns and occupies twelve buildings, which were erected at a cost of $350,000. Four of these buildings are in the heart of Denver, namely, the Music Building, the Haish Building, which is the home of the professional schools, the Medical Laboratory Building, and the Medical Dispensary Building. The other eight buildings are at University Park, a suburb of Denver. Among these buildings at University Park the most notable are: University Hall, the Chamberlin Observatory, and the Carnegie Library. The Chamberlin Observatory, the gift of the late Humphrey R. Chamberlin, is a conspicuous astronomical station, and contains a 20-inch telescope by Alvan Clark & Sons. The enrollment for 1906 was 1200, divided as follows: In the colleges, 700; in the Music College, 350; in the preparatory school, 150. In 1906 there were 165 professors and instructors. All the properties and endowments amount to more than $700,000.

DENZINGER, dĕn'tsĭng-ẽr, FRANZ JOSEPH (1821-94). A German architect. He was born at Liège, Belgium, where his father was professor at the university. He studied at Würzburg, then in Munich at the Polytechnic Institute and under Gärtner at the Academy of Arts. In 1854 he entered the Government service at Regensburg, and in 1859 was appointed architect of the cathedral, the restoration and completion of which he carried out in the most successful manner. His next important work was the reconstruction of the cathedral at Frankfort-on-the-Main, which had been destroyed by fire in 1867. Here he also erected the building of the municipal archives and the Dreiköningskirche. Among his other structures may be mentioned the chemical laboratory of the university at Erlangen and the saline bathing establishment at Kissingen. He died in Nuremberg.

DE'ODAND (ML. *deodandum,* to be given to God, from *Deo,* to God + *dandum,* to be given). In English law, a term applied to any chattel which was directly instrumental in causing the death of a human being, either by accident or by homicide. Where a person was thus killed a jury was summoned, and, if any domestic animal or inanimate thing was found to be the immediate cause of his death, it was forfeited to the Crown, usually for pious or charitable uses—'to appease God's wrath,' as some of the early writers put it. Thus, if a horse and cart ran over a person and killed him, they were forfeited as accursed things, irrespective of whether they belonged to the deceased or to some other person who was not otherwise connected with the accident. The right or franchise to have all deodands in a certain district was sometimes granted to individuals by the Crown. This curious law, which has its analogies in many primitive legal systems, was not finally abolished in Great Britain until the year 1846 by statute (9 and 10 Vict., c. 62). It was never recognized in the United States. Consult: Blackstone, *Commentaries on the Laws of England;* Stephen, *History of the Criminal Law of England* (London, 1883).

DE'ODAR'. See CEDAR.

DEODORIZER (from Lat. *de,* from, away + *odor,* smell, scent). Any chemical substance employed for the purpose of absorbing or destroying the odoriferous principles evolved especially from decomposing animal and vegetable matter. They strictly belong to the classes of substances known as antiseptics (q.v.) and disinfectants (q.v.).

DE OFFICIIS, dē ŏf-fĭsh'ĭ-ĭs (Lat., On Duties). A treatise on morals by Cicero, addressed directly to his son Marcus. The work is in three books, but is doubtless incomplete.

D'ÉON DE BEAUMONT, dȧ'ôN' de bō'môN'. See EON DE BEAUMONT.

DEOPRAYAG, dā'ō-prȧ-yăg', or **DEVAPRAYAGA,** dā'vȧ-prȧ-yä'gȧ (Skt., altar of the gods). A village of the native State of Garhwal, India, remarkable chiefly for its situation at the fork of the Alaknanda and the Bhagirathi, whose united waters immediately assume the name of Ganges (Map: India, C 2). Marking, as it were, the source of the sacred river, Deoprayag is a favorite place of pilgrimage for the Hindus. There are an ancient temple, a flight of steps in the rock down to the brink of the mingled streams, and three basins excavated in the solid stone a little below the level of the surface of the current. The permanent population, about 1000, consists chiefly of Brahmins.

DE O'RATO'RE (Lat., On the Orator). A dialogue in three books by Cicero (B.C. 55), treating of the studies necessary for an orator, the matter, and the form and delivery of a speech. The principal speakers are the great orators Lucius Crassus and Marcus Antonius. The treatise is a masterpiece, showing Cicero's best style in a subject with which he was intimately familiar.

DEPARTMENT (Fr. *département,* from Lat. *dispartire,* to divide). An administrative division in France. The old provincial divisions were abolished by the Constituent Assembly in 1790, and the country was divided into 83 departments. This was done at the instance of Mirabeau, who pointed out the necessity of wiping out the ancient territorial boundaries in order to concentrate power in the hands of the Central Government, and to destroy the influence of the aristocracy, which, based upon ancient custom, was still strong in the provinces. In the redistribution, care was taken to efface as far as possible ancient political divisions; and in a large number of instances a department was constituted out of territory taken from two or more provinces. Most of the departments were named after rivers or mountains. The number of departments at present is 87. At the head of each is a prefect, appointed by the President of the Republic, and assisted by a *conseil de préfecture.* The departments are subdivided into arrondissements.

DEPARTURE. In nautical language, a distance along a parallel of latitude measured in nautical miles; especially the distance east or west made by a ship. When the course is neither east nor west the *departure* = *distance sailed* × *sine of course.* Since minutes of longitude are in length proportional to the cosine of the latitude in which they are measured, we have *depar-*

ture (in nautical miles) = *minutes of longitude* × *cosine of the latitude* in which the departure is measured. To determine the exact position of a ship when starting upon a voyage and after leaving port is termed *taking a departure.* It is usually done by observing the bearings of two or more objects and transferring those bearings to a chart whence the exact point is determined. For use of this term in surveying, see article SURVEYING.

DE PAUW UNIVERSITY. An institution of higher learning situated at Greencastle, Ind. It was founded by the Indiana Conference of the Methodist Episcopal Church in 1837, and was known until 1884 as the Indiana Asbury University. In recognition of the many gifts made to the university by Washington C. De Pauw, who, besides donations during his lifetime, provided in his will for an endowment fund of about $1,000,000, the name of the institution was changed in that year to De Pauw University. With the expected increase in the endowment fund, the university entered upon a course of rapid expansion. Schools of music, law, theology, pedagogy, and the fine arts were organized and graduate courses were introduced in the School of Liberal Arts. Much of the De Pauw bequest has not, however, become available as yet, and the plan formulated in 1884 has not been carried out to its full extent. De Pauw University at present consists of the colleges of liberal arts, music, and art. It offers courses, partially elective, leading to appropriate degrees in art and science. The enrollment of students in 1905 was 787, including students in the musical and preparatory departments.

DEPENDENT CHILDREN. A term applied to normal children who must be supported by other than their natural guardians. It does not include the deaf and dumb, blind, insane, epileptic, and feeble-minded, who are classified as *defectives*, nor those of perverse habits, known as *juvenile delinquents.*

In ancient times the Semites placed a higher value on children than did the Aryans. Among the Aryans, however, childless families sometimes adopted children. The father in Greece and Rome had practically power of life and death over his children and could sell them into slavery. Infanticide was common. Yet the children left alone were not entirely neglected, and their adoption was encouraged by decrees making them the slaves of those caring for them. Not until after the introduction of Christianity do we find any special attention paid to child-saving. From that time to the present among Europeans and their descendants, and wherever Christian missionaries have gone, we find increasing attention paid to dependent children.

In the sixth century came the beginnings of special institutions for such children in France, and a little later in Italy. (See FOUNDLING HOSPITAL.) From these humble beginnings the great institutions now found in all civilized lands have grown. The State has come to recognize that it is responsible for the proper care of the children, and is gradually extending its efforts for the sake of its own future welfare, as well as for that of the children.

From the practice of receiving young children into institutions to save their lives there naturally developed the belief that such institutions were even better places for the children than any family home. Here children would be kept from the temptations of the world; here they would be cared for by skilled matrons and taught by chosen teachers; here, too, religious instruction would be planted in fruitful soil. The Church, under whose influence these institutions arose, encouraged this belief. This is the principle underlying all institutional care for dependent children. The highest development of this principle is found in the institutions of the Catholic Church and of the Hebrews, in which it is possible for a child to pass from infancy to maturity, constantly guarded from the world. Europe, except France, has largely followed this method, and it is widespread in America.

The older plan of rearing dependent children in family homes has, however, kept a foothold and is latterly coming rapidly to the front. It exists in two forms. In the first the children are boarded out in families, the board being paid by societies organized for the purpose of caring for children or by the State. This system has been successfully carried on in Scotland and England, but has found its greatest development in Australia and France. In France a special department of the Government, with branches in the provinces, boards out the children and supervises them until they are twenty-one years of age. No board is paid after the twelfth year, the children being then indentured. In the second form the children are placed out for adoption or are indentured to persons willing to receive them and to assume all responsibility for their maintenance and education. After the initial expense of finding and investigating a home, this system costs the public nothing save the expense of supervision to safeguard the interests of the child. This plan has found its chief field in Canada and the United States.

In America during colonial times children were apprenticed in families or were consigned to the almshouse. It was gradually recognized that the influence of the almshouse was degrading, and the leading States now forbid the practice. It still prevails in the Southern States. Illinois is the only prominent Northern State permitting it. The movement for institutions began about 1800 and rapidly spread in the larger cities. Organized effort for placing children in family homes started with the founding of the New York Children's Aid Society in 1853. Similar societies are now found in most cities. The first of the children's home societies was started in Illinois in 1883. They now exist in twenty-four States, chiefly in the West. Their work has been largely outside the big cities.

The advocates of the institutional plan and those who favor the placing-out system have long been at swords' points. Each has claimed that the other system did not produce the best results. There is taking place in America, however, a gradual amalgamation of the two systems. It is now admitted that the institution fosters a pride which tends to develop the institution at the expense of the child; that institutional life is artificial and cultivates dependence rather than independence. On the other hand it is admitted that some children need for a time the training in obedience and in respect for authority which institutional discipline gives; that children in bad physical condition often receive better care in an institution than is possible in the average home; that the work of placing out children must be most carefully done to avoid putting children in bad homes; that it is sometimes hard to find the proper place for a particular child. To-day institutions are placing out many children, while placing-out agencies are sending children to institutions for temporary care. Both agree that the home is the normal place, and that the place of the institution is to give the necessary training to fit the child for home life. It has so far been possible to find free homes for most of the children placed out, and the boarding-out system has been in use only in the East.

The general interest in the subject has led to the active participation of the State. In New York, California, Pennsylvania, and, to a lesser degree, in other States, subsidies have been granted from public funds to private societies. The result has not been satisfactory. Large institutions have been built up which tend to receive children not really dependent for the sake of additional revenue. The result is plainly seen by comparing New York with 1 dependent child to 200 of population; California, 1 to 225; Pennsylvania, 1 to 600, with Ohio, 1 to 1000; Indiana, 1 to 1110; Michigan, 1 to 12,500. Ohio and Indiana have systems of county homes, the various counties individually or in combination maintaining institutions. Michigan in 1874 opened what is known as the State Public School (q.v.). All children becoming public charges are sent to this school and are placed out as soon as seems best. The result has been an actual decrease in the number of dependent children. This system has been adopted in Rhode Island, Wisconsin, Minnesota, and Colorado. In Massachusetts and Pennsylvania the boarding-out system has been largely developed. The State homes for the orphans of soldiers and sailors, started soon after the Civil War, have been generally abandoned or turned into orphan asylums. There is now a strong movement toward State control and supervision of the work for dependent children. New Jersey has organized a State Board of Children's Guardians. Indiana has appointed a State agent. Consult: Wines, *Prisons and Child-Saving Institutions* (Cambridge, Mass., 1880); Hill, *Children of the State* (London, 1889); Folks, *Care of Destitute, Neglected, and Delinquent Children* (Albany, 1900); Henderson, *Introduction to Study of Dependents, Defectives, Delinquents* (Boston, 1893); id., *Modern Methods in Charity* (New York, 1904); *Report of Committee on History of Child-Saving* (Boston, 1893). See Foundling Hospital.

DEPENDENTS, DEFECTIVES, DELINQUENTS. Dependents are those who must be supported by other than their natural guardians or family. Defectives are those who are not normally developed, the blind, etc. Delinquents are those who commit acts forbidden by law. This classification is not satisfactory, but it is in very general use. See Social Debtor Classes.

DE PERE, d*e* pâr *or* d*e* pẽr. A city in Brown County, Wis., five miles southwest of Green Bay; on the Fox River, and on the Chicago and Northwestern and the Chicago, Milwaukee and Saint Paul railroads (Map: Wisconsin, F 4). Lake steamers ascend the river as far as De Pere. The city has good water-power and is the seat of extensive manufactures of bricks, pottery, writing-paper, cigars, sash and doors, skiffs, yachts, launches, flour, woolen goods, foundry products, dairy products, etc. There are also several limestone quarries. Cattle, grain, and hay are among the exports. A steel bridge over the river 1600 feet long connects the east and west sides of the city. Population, in 1900, 4038; in 1905, 4523.

DEPEW′. A village in Erie County, N. Y., 9 miles east of Buffalo, on the New York Central, the Delaware, Lackawanna and Western, the Erie and the Lehigh Valley railroads (Map: New York, B 3). Its chief manufacturing industries are locomotive and coupler works, storage battery and spring and gear factories. The town was named after Senator Chauncey M. Depew. Population, 1890, 3379; 1905, 3535.

DEPEW′, Chauncey Mitchell (1834—). An American lawyer, railroad president, politician, and orator. He was born in Peekskill, N. Y., graduated at Yale in 1856, was admitted to the bar two years later, and soon took an active part in politics. He was in the State Assembly in 1861 and 1862, and Secretary of State from 1863 to 1865. In 1866 he became attorney for the New York and Harlem Railroad, and held a similar position for it and the New York Central after their consolidation in 1869. He was elected second vice-president in 1882, and was president from 1885 to 1898, when he resigned this position and the presidency of the West Shore Railroad, to become chairman of the entire Vanderbilt system. In 1899 he was elected United States Senator from New York. He had declined the State portfolio in President Harrison's Cabinet in 1892. He delivered addresses at the Washington Centennial in New York, in 1889, and the dedication of the World's Columbian Exposition, at Chicago, in 1893; and orations at the memorial services of President Garfield and General Sherman. He became a regent of the University of the State of New York in 1874. Senator Depew became involved in the investigation of certain New York life insurance companies in 1905, with the result that he repaid to the Equitable Life Assurance Society, of which he was a director, a loan made to a concern in which he was interested; and in December of that year he resigned from the directorate of the Equitable. In January, 1906, Senator Brackett introduced in the New New York Legislature a resolution calling upon Mr. Depew to resign his United States senatorship, but the measure was defeated.

DE PEYSTER, d*e* pīs′tẽr, Abraham (1658-1728). An American merchant and colonial official, born in New Amsterdam (New York). He was mayor of New York from 1691 to 1695, and afterwards Chief Justice of the province, and president of the King's Council, in which capacity he acted as Governor in 1701. He served as colonel of the militia of the city and county of New York, and as treasurer of the provinces of New York and New Jersey.

DE PEYSTER, Arent Schuyler (1736-1832). An American soldier, born in New York City, and prominent as a Royalist at the time of the Revolution. From 1775 to 1783 he was in command, at different times, of Detroit, Mackinac, and several posts in Upper Canada, and endeavored to turn the Western Indians against the United States. After the war he removed to Dumfries, Scotland, where he became a friend of Burns.

DE PEYSTER, Johannes (1600-85). One of the early settlers of New York, and the founder of a noted American family. In the colony, then New Amsterdam, he held the offices of burgomaster and deputy mayor, and as such resisted the cession of the province to the British in 1664 and 1674.

DE PEYSTER, John Watts (1821—). An American writer on military and historical subjects. He was born in New York City; was educated at Columbia; became colonel in the State militia in 1845, adjutant-general in 1855, and brevet major-general in 1866. Among his works are: *Life of Field Marshal Torstenson* (1855); *The Dutch at the North Pole, and the Dutch in Maine* (1857); *Personal and Military History of Gen. Philip Kearny* (1869); and *The Real Napoleon Bonaparte* (1897). Consult Law, *Here and There in Two Hemispheres* (Lancaster, Pa., 1903).

DEP'HAL. See Breadfruit Tree.

DEPIL'ATORIES, or Epilatories (Lat. *depilare,* to pull out hair, from *de,* off + *pilus,* a hair). Certain agents employed for removing hair from the skin. They were extensively used by the ancients, but are now restricted in their employment to the face, and to the removal of the hair from the scalp in the treatment of certain diseases. The caustic alkalies and alkaline earths are generally used, and one recipe consists of 5 parts of caustic or slaked lime, 10 parts of carbonate of soda, and 40 parts of lard. The trisulphide of arsenic (commonly known as orpiment) is occasionally used, but its employment is dangerous. A mixture of caustic lime and orpiment constitutes some of the depilatories to be purchased; and it is believed that the Turkish *rusma* is composed of these ingredients. A strong galvanic current is used by physicians for the purpose, applied to the root of each hair by means of a needle electrode.

D'ÉPINAY, dȧ'pē'nȧ', Madame. See Epinay, Madame d'.

DÉPIT AMOUREUX, dȧ'pē'tä'mo͞o'rẽ', Le (Fr., The Lovers' Quarrel). A comedy by Molière (1654), which shows the author's gradual emancipation from the Italian influence, visible in his previous work.

DEPONENT. A term in Latin grammar applied to verbs having a passive form but an active signification. They are so called because they, as it were, lay down (Lat. *deponere*) or dispense with the signification proper to their form. Such verbs had all originally a reflexive meaning; thus, *aversor,* "I shun," means radically, "I turn myself away from."

DEPOSIT, or **DEPOSITUM** (from ML. *depositare,* from Lat. *deponere,* to lay down). In a legal sense, a term implying possession of personal property by some one not the owner, either by virtue of a delivery thereof, or from some other source as binding, and under such circumstances that he is legally bound to keep it for the benefit of the person who so delivers it, or whoever is, or rightfully becomes, entitled to the possession, and to give up possession at any time, on demand, to such person or persons. It is the most common form of bailment (q.v.), as every case where a person hands another something to hold, or keep for him, for however short a time, comes under this title, and is subject to the rules of law governing it. The bailee or depositary, as the person who thus receives the property is called, must take such care of it as a reasonable man would of his own goods; but if he does this he is not liable for any loss happening while it is in his hands. The depositary cannot use the property for his own benefit unless there is an express agreement, or attendant circumstances from which consent of the owner or bailor can be reasonably inferred. Money in a bank to a person's credit, although ordinarily spoken of as a deposit, does not strictly come within the legal use of the term, and is sometimes designated as an 'irregular' deposit. The reason for this is because the bank is only required to return an equivalent amount, and not the particular bills or specie originally delivered to it; and the chief characteristic of a true deposit is that the identical thing is to be kept and returned intact. See Bailment; Commodatum; Debt; Mandate; Pledge.

DÉPOSITION (OF. *deposition,* Fr. *déposition,* from Lat. *deponere,* to lay down). The testimony of a witness, legally taken and committed to writing, by or in the presence of a judge, referee, commissioner, notary public, or other duly qualified official person. It is usually taken by virtue of a commission, or letters rogatory (q.v.) issuing out of the court in which the action is pending, or which has jurisdiction of the subject matter, if taken before trial.

The questions may be asked orally or may be submitted to the witness in the form of written interrogatories. The legal representatives of all parties to the action or proceeding are entitled to be present and to cross-examine the witness, or submit cross-interrogatories to be answered. If the competency of the witnesses or the admissibility of the questions or answers is objected to, the objection may in some jurisdictions be stated to the court or officer taking the deposition, and he may either rule on the question at once, noting the objection, ruling, and exception, or reserve it for the opinion of the court from which the commission issued.

The laws of the State having jurisdiction of the litigation in which the evidence is to be used regulate the manner of taking the testimony, irrespective of the jurisdiction where it is taken. The competency and admissibility of the testimony are determined by the rules of evidence in force where it is offered in court. Depositions are used in all courts, and they may be ordered taken where witnesses are out of the jurisdiction, or, if within the State, if they are very old and infirm or in feeble health, in order to perpetuate their testimony in case of death before the trial. They cannot be used, however, where the witness himself can be produced. See Evidence; Testimony; Letters Rogatory.

DEPOSITION. One of the severest penalties which can be inflicted on a clergyman. As long as ordination was practically connected with the right to serve in a particular church, the withdrawal of this right was equivalent to exclusion from all clerical rights; but with the development of the clergy as a privileged order, and when absolute ordinations and changes of place became common, deposition in the stricter sense was confined to the withdrawal of local rights, and the term degradation came into use in the twelfth century to signify entire removal of clerical rights. Owing to the belief among Roman Catholics that holy orders are indelible, the spiritual powers of a deposed priest are held to remain, but he has no right to exercise them, and if he attempts to do so commits an additional grave sin. In case the penalty is remitted upon his proved repentance, he needs, of course, no reordination. Bishops could formerly be deposed by their metropolitan with twelve other bishops as assessors; the right was later reserved to the Pope. The solemn degradation of a priest included many awe-inspiring ceremonies, such as the removal, piece by piece, of all the sacred vestments designating the successive orders to which he had attained, the scraping of the thumb and finger which had been anointed at ordination, and the shaving of the head to obliterate the tonsure; but it is practically obsolete. Only the bishop can depose a priest, and he requires for solemn degradation the assistance of at least six dignified clerics learned in the law.

In England a minister may be deposed by a bishop with the assistance of such of his advisers as may conveniently be had. In Scotland the power belongs to the Church courts. A minister there deposed necessarily loses not only his ecclesiastical dignity, but the temporalities of his benefice as well, which becomes vacant the same as if he were dead. In the United States the power to depose is exercised by the various religious bodies, but the practical result is nothing more than exclusion from the pulpit of the particular denomination. The reasons which may justify such action are scandalous or immoral conduct, preaching or publishing doctrines contrary to the Church standards, or contumacious disrespect for Church authority. See Orders, Holy; Discipline, Ecclesiastical. Consult Kober, *Die Deposition und Degradation nach den Grundsätzen des Kirchenrechts* (Tübingen, 1867).

DE′POT, *French pron.* dȧ′pō′ (Fr. *dépôt*, OF. *depost*, from Lat. *depositum*, deposit, from *deponere*, to deposit, from *de*, down + *ponere*, to put). A place set apart for the storage of munitions of war, or other army stores, as the United States powder-depots at Dover, Del., and Saint Louis, Mo. In England and Continental Europe generally the name refers specifically to the headquarters of regiments or divisions, or district headquarters of the territorial recruiting system, according to the country and its army organization. In England, in some instances, it has the same application as in the United States.

DEP′PING, Georg Bernard (1784-1853). A German-French historian. He was born at Münster, Westphalia, settled in Paris in 1803, was employed for a time as a teacher in several institutions, and subsequently contributed to French and German periodicals. He wrote on a wide range of subjects. Two of his juvenile works attained wonderful popularity: *Merveilles et beautés de la nature en France* (1811); and *Les soirées d'hiver*, including the instructions of a father to his children on moral and scientific subjects. He assisted Malte-Brun in his geographical works, and published a number of histories, books of travel, and biographies, including: *Histoire des expéditions maritimes des Normands* (1826); *Histoire du commerce entre l'Europe et le Levant depuis les croisades* (1832); and *Les Juifs au moyen âge* (1834).

DEPRÈS, de-prȧ′, Josquin (c.1450-1521). A Flemish composer, and one of the world's greatest masters, born at Condé, Hainaut. He was the successor of Okeghem, and the immediate predecessor of Lassus and Palestrina in the evolution of music. Little is known of the details of his life, but there is record of his appointment as chapel-master of Saint Quentin, and that he studied under Okeghem. From 1471 to 1484 he was at the Court of Pope Sixtus IV., and was regarded as the future great musician of the world. The library of the Sistine Chapel to this day treasures much of the fruits of his stay in Rome. During his lifetime he visited or held appointments from the greatest princes and courts of the world. His high place in musical history is due to the fact that, besides being an expert contrapuntalist, his artistic sense of balance, and of the religious proprieties, enabled him to utilize the technical intricacies of Flemish counterpoint, and yet make them subsidiary to his beautiful and expressive melodies. Other composers of Josquin's school had developed the custom of taking a secular cantus firmus, the voice to which it was assigned singing the secular words, the remaining voices singing those of the mass proper. So grave an abuse did this custom become, that a reform was brought about in church music, and all such compositions were condemned. Josquin, however, had consistently striven to realize the emotional content of the words of the mass in his compositions, so far as he was able, although many instances are found in his works where a few syllables are scattered through several pages, indicating that the music was of far greater importance than the text. The invention of music-printing by movable types at a time (1498) when Josquin was at the height of his fame as a composer did much to make his music universally popular. Consult: Menil, "Josquin de Près," in *Revue Internationale de Musique*, No. 21 (Paris, 1899).

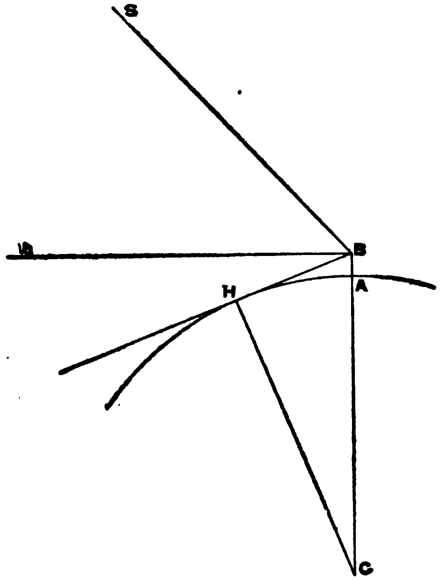
DEPRESSION (Fr. *dépression*, from Lat. *deprimere*, from *de*, down + *premere*, to press), or Dip of the Horizon. The angle through which the sea-horizon appears depressed in consequence of the elevation of the spectator above the surface of the water.

Let A be a point on the surface of the earth, B a point situated in a vertical line from A. Let BH be a tangent to the earth's surface drawn from B, Bh a line in the same vertical plane perpendicular to AB. The angle hBH is the *true* dip of the horizon to a spectator at B.

The true dip measured in minutes is equal to the distance in nautical miles of the visible horizon. Let C be the centre of curvature of the surface; then, since CHB is a right angle, the angle $h\mathrm{BH} = \mathrm{HCA}$; and the minutes in this angle are the nautical miles in the arc AH.

The true dip of the horizon, however, is not exactly the same as its apparent depression. The apparent sea-horizon is raised above its true place by atmospheric refraction through an angle which varies according to the state of the atmosphere and the relative temperatures of the air and water, the variation ranging from one-third to one-twenty-third of the amount of the true dip. The rule commonly employed is to diminish the true dip by about one-fourteenth of its amount, to find the apparent dip.

If S be a star or the sun in the same vertical plane with ABH, and an observation of the altitude above the sea-horizon be made by means of a sextant from the point B (as from the deck of a vessel), the apparent dip of the horizon must be subtracted from the observed angle, in order to find the altitude of the sun. Owing to the uncertainty of the amount of refraction, the nearest minute to the dip given in the tables is usually taken. The following table gives a notion of the amount of the apparent dip under ordinary state of the atmosphere and equal temperature of air and water:



Height, feet	Dip ′ ″	Height, feet	Dip ′ ″
0	0 0	8	2 46
1	0 59	9	2 56
2	1 23	10	3 6
3	1 42	20	4 23
4	1 58	30	5 22
5	2 11	40	6 12
6	2 24	50	6 56
7	2 36	100	9 48

DEPRETIS, dâ-prā′tês, AGOSTINO (1813-87). An Italian statesman, born at Mezzana, near Stradella, Piedmont. He studied and practiced law in Turin, and early took an active part in the national movement toward bringing about the unity of Italy, especially after his election to the Piedmontese Chamber, in 1848, where he vigorously supported the opposition. He established in Turin the liberal journal *Il Progresso.* Cavour appointed him civil Governor of Brescia in 1859, and pro-dictator at Palermo in 1860, where he displayed great zeal in urging ing the adherence of Sicily to the United Kingdom. He held various portfolios in the Cabinet in the years 1862, 1866, 1876, 1878, and 1881, and was several times Prime Minister. He became the leader of the opposition after Rattazzi's death in 1873, and from 1876 on grew to be a more and more conspicuous figure in modern Italian history, promoting the adoption of many measures, such as the abolition of oppressive taxes, the creation of free ports, and electoral reform. He died at Stradella, where a monument was erected to his memory in 1893.

DEPREZ, de-prâ′, MARCEL (1843—). A French engineer and electrician, who has produced several remarkable mechanical and electrical inventions. He undertook an expensive series of experiments at Munich in 1872, and in 1882 announced that he had succeeded in transmitting power by telegraph wire for a distance of 35 miles, between Munich and Miesbach, which is said to have been the first successful experiment in the transmission of electric power through a considerable distance. Further experiments were successfully carried out on the line of the Northern Railway of France. He became a member of the Academy, professor of electricity at the Conservatoire des Arts et Métiers, and professor of physics at the Collège de France.

DE PROFUN′DIS (Lat., Out of the depths). The first words of Psalm cxxx., which forms a portion of the office of the dead in the Roman Catholic Church.

DEPTFORD, dĕt′fẽrd (formerly *Depeford,* deep ford). A former town of Kent and Surrey, England, at the mouth of the Ravensbourne, on the right bank of the Thames, three miles southeast of London Bridge, now a metropolitan and Parliamentary borough of Greater London (q.v.) (Map: London, E 8). The London cattle market here, covering 30 acres, occupies the site of the historic admiralty dockyard, established by Henry VIII., where Queen Elizabeth in 1581 knighted Drake in the ship in which he had encompassed the world, and where, in 1691, Peter the Great toiled as a shipwright. It was closed in 1869, but the immense victualing yard for the British Navy, with its extensive establishments, remained, and there are also important marine engineering establishments and electric-lighting plants for illuminating the metropolis. Deptford is a favorite residential section for London merchants. Population, in 1901, of Parliamentary borough, 117,844.

DEPUTY (OF. *depute,* Fr. *député,* from ML. *deputare,* appoint, select). One authorized by law to exercise all, or certain, of the functions of an office held by another, as an assistant to the incumbent, and accountable to him. Acts done by a deputy in his official capacity are of the same force and effect as if done by the officer himself. A deputy does not need special authority for each particular act, but proceeds under the general powers vested in him by law, although usually his superior may limit his duties and supervise his work. An officer is generally responsible for the acts and conduct of his deputies to some extent, and, therefore, is usually given the power of selecting and appointing them.

A deputy is required to take an oath of office; his salary is usually fixed by law; and he is frequently required to give a bond for the honest and faithful performance of his duties. Generally only administrative and executive officers, such as sheriffs, constables, county clerks, etc., are authorized to appoint deputies, as judicial officers, even of very limited jurisdiction, are usually accountable only to the Government, and not to other officers of a higher rank. See CORONER; MARSHAL; SHERIFF.

DEPUTY (in French politics). See POLITICAL PARTIES, FRENCH.

DE PUY, de pū, WILLIAM HARRISON (1821-1901). An American Methodist Episcopal clergyman. He was born at Penn Yan, N. Y., and was educated at Genesee College, Union University, and Mount Union College. In 1866 he was appointed editor of the *Methodist Year Book* and conducted that publication until 1889. He was also for many years co-editor of the publication known as the *New York Christian Advocate*. His publications include: *Compendium of Useful Information* (1878); *The People's Cyclopædia of Universal Knowledge* (1882); *The People's Atlas* (1886); *American Revisions and Additions to Encyclopædia Britannica* (1891); *University of Literature* (1896). Several of these works have had wide circulation.

DE QUIN'CEY, THOMAS (1785-1859). A great English prose writer. He was born in Manchester, where his father had been a successful merchant in the foreign trade, and left at his death an estate producing about £1600 a year. The future essayist as a child was retiring and sensitive, alien from the actualities of life; and even before his opium-eating had begun, his natural tendency was to live in a dream-world of his own creation. Yet in some directions he made remarkable progress in his studies at the grammar schools of Bath and Manchester, especially in Greek. "That boy," said one of his teachers, "could harangue an Athenian mob better than you or I could address an English one." He ran away from the Manchester school, and had a brief adventurous career among the Welsh hills and in London, where he remained a year and nearly starved before he was discovered by his family and sent to Worcester College, Oxford. Here he spent five years, though he left the university without a degree. During this period, in 1804, he resorted for the first time to opium as a cure for severe rheumatic pains in the head; and the habit grew upon him as rapidly and to almost as disastrous an extent as it did upon Coleridge, gaining a hold upon him which he was never able entirely to shake off, though by 1821 he had succeeded in reducing the quantity sufficiently to allow regular and sustained work. In 1808 he took up his residence on the borders of Grasmere, attracted thither by his affectionate veneration for Wordsworth and Coleridge. Here he enjoyed their society and that of Southey and 'Christopher North', read widely in classical, German, and English literature, and began to produce his own magnificent contributions to the latter. The events of his later years are not very diversified or striking, and it is difficult to trace them accurately from his own autobiographical remains, which have at times the vagueness and inconsequence of his opium dreams. In 1816 he married, and during the rest of his life supported himself and his family almost entirely by his pen, though often embarrassed by the money difficulties which seem inseparable from a certain type of literary genius. After several years spent in London, his connection with *Blackwood's Magazine* drew him to Edinburgh, in or near which he spent the rest of his life, finding a grave there in the West Churchyard.

Nearly all his work appeared first in periodicals—*Blackwood's*, *Tait's*, and the *London Magazine*; but its remarkable qualities led to its preservation from the fate of merely ephemeral literature. His first great success was the *Confessions of an English Opium-Eater*, which appeared in the *London Magazine* in 1821, and attracted universal attention. Only a small part of it is devoted to the results of the drug, the rest being a fascinating, if discursive, sketch of the scenes and surroundings of his life up to that time. It was ultimately supplemented by the darker *Suspiria de Profundis* (1845), made up of the marvelous and terrible imaginings inspired by opium. His grim humor is well represented by *Murder Considered as One of the Fine Arts* (1827), and the penetration of his imaginative criticism by his essay *On the Knocking at the Gate in Macbeth* (1823). Special mention may also be made of his *Letters to a Young Man* (1823), and of his essays on *Style and Rhetoric* (1840); on *Joan of Arc* (1847), and *The English Mail Coach* (1849). A series of about thirty articles, collected in 1853 under the title of *Autobiographic Sketches*, is also of great interest. In criticism, De Quincey must be regarded very highly; his view of things might be called essentially analytical. His *Literary Reminiscences* embraces broad views of Lamb, Coleridge, Wordsworth, Southey, and others, and there are also studies of Shelley, Keats, Goldsmith, Pope, Godwin, Hazlitt, Landor, etc. It is difficult to find critical matter so luminous and scientific, and the style, at its best incomparable, is as brilliant as the judgments are just.

His great importance to literature lies in the new possibilities which he revealed in English prose. He has himself in the *Confessions* associated together the names of the seventeenth-century authors who come nearest to being his models in style: "Donne, Chillingworth, Sir Thomas Browne, Jeremy Taylor, Milton, South, Barrow form a pleiad of seven golden stars such as no literature can match in their own class." But the claim involved in his designation of the *Confessions* and *Suspiria* as "modes of impassioned prose ranging under no precedents that I am aware of in any literature," may be justified by the fact that the gorgeous, colorful, and rhythmical prose in which De Quincey equaled or surpassed his predecessors was in his hands a deliberate and formal style, whose 'purple patches' are seldom out of place, and whose majestic and soul-stirring harmonies can be paralleled only among musical instruments by the rich fullness of a great organ. Ruskin is his most conspicuous successor in this style; but it had a wide influence throughout the remainder of the century. His writing is far from faultless; it has two considerable defects—a tendency to lapse, in the midst of a lofty strain, into pointless triviality, and a discursiveness which renders it impossible for him to go straight along the high road of his main thought without darting off to right and left to explore little green lanes of whimsical fancy or erudite allusion. He will never, perhaps, be a popular writer. He postulates in the reader who is to enjoy him fully too similar an equipment in culture, in imagination, in wide knowledge of books and men; but for that very reason he must remain all the more valued by those who are able to appreciate him—an intellectual luxury and stimulus alike. According to his own famous distinction between the 'literature of knowledge' and the 'literature of power,' it is to the latter class that his own work belongs; and of it may be predicated his general conclusion that such literature will remain "triumphant forever, as long as the language exists in which it speaks."

Consult: His *Collected Writings*, ed. by Masson (14 vols., London, 1889-91), and some additional *Uncollected Writings*, ed. by Hogg (ib., 1890); Japp ("H. A. Page"), *Life and Writings of De Quincey* (2 vols., ib., 1877); Masson, *De Quincey* (ib., 1881); Findlay, *Personal Recollections of De Quincey* (ib., 1885); also essays by Saintsbury in *Essays in English Literature, 1780-1860*, first series (ib., 1890); and Stephen, *Hours in a Library* (ib., 1874-79). There is an excellent study from the scholastic point of view in Minto, *Manual of English Prose Literature* (New York, 1886).

DERA GHAZI KHAN, dĕr′ȧ gȧ-zē′ ᴋän. The capital of a district of Derajat, Punjab, British India, near the Indus, 45 miles southwest of Multan. Of several large and handsome mosques the chief are those of Ghazi Khan, Chuta Khan, and Abdu'l Jawar. An important military cantonment and civil establishment are west of the town. The chief industries of the district are agricultural; wheat and indigo are exported. Population, in 1891, 27,886; in 1901, 23,731.

DERA ISMAIL KHAN, ĕs′mȧ-ēl′ ᴋän. The capital of a district of Derajat, Punjab, British India, 120 miles northwest of Multan. The town, situated four miles from the right bank of the Indus, is of modern construction, dating from 1823, when a flood swept away the old town on the river bank. An important trade is carried on with Afghanistan, and there is a well-equipped bazaar where the local manufactures of inlaid woodwork, scarfs, and cotton cloth are traded. Wheat and wool are exported. A military cantonment is stationed here. The old town was founded in the fifteenth century by Ismail Khan, a Baluchi chief whose dynasty lasted through three centuries. Population, in 1891, 26,884; in 1901, 31,737.

DERAH, dĕ-rä′. The Egyptian unit of measure of length. The one most in use is 22.37 English inches, or 57 centimeters. The derah is divided into the *kadam*, one-half; the *abdat*, one-sixth; and the *kerat*, one twenty-fourth. The derah by which dry goods are sold is 25½ inches, and the derah of Constantinople is 66.34 inches.

DERAIYEH, d*e*-rī′y*e* (from Ar. *dair*, camp, house). A ruined city of Arabia in the District of Nejd. It was formerly the capital of the Wahabis and residence of the Sultan of Nejd and was a town of considerable importance (Map: Turkey in Asia, R 11). It was destroyed by the Egyptian forces under Ibrahim Pasha in 1818, and since then it has been little more than a small settlement in the midst of the ruins of the old city, with a population of about 1500.

DERAJAT, dẽr′ȧ-jät′ (Ar., camps, pl. of *dair*, camp, house, from *dāra*, to abide). A division of the Punjab, British India, in the valley of the Indus (Map: India, B 2). The principal town is Dera Ghazi Khan.

DERBE, dẽr′bė. An ancient city of Asia Minor. Little is known of its history, though from notices in Strabo (535, 567, and 569) it may be inferred that it was a place of some importance. It was situated in a district west of the old southern Cappadocian kingdom of Amyntas. Originally a part of old Lycaonia, in the confusion resulting from the breaking up of the Greek kingdoms of Asia Minor, Derbe, in the first century B.C., became the independent capital of one Antipater, called by Strabo a 'pirate,' who was conquered by Amyntas about B.C. 28.

Throughout the various changes of local governments incidental to the Roman administration of Asia Minor, Derbe continued in possession of the kings of Cappadocia until A.D. 41, when it was incorporated by Claudius with the large province of Galatia.

Derbe was the last city reached by Paul on his first missionary journey (Acts xiii. and xiv.). Here a Christian church was founded by the Apostle. On his second and third journeys he again visited the place (Acts xvi. I; xviii. 23). Derbe was probably one of the cities whose Christians were addressed by Paul in the Epistle to the Galatians. See GALATIANS, EPISTLE TO THE.

The site has been identified by Ramsay, after Sterrett, as that now occupied by the ruins near the mound of Gudelissin, about 45 miles south by east of the modern Konieh (Iconium). Consult: W. M. Ramsay, *The Historical Geography of Asia Minor* (London, 1890); id., *Saint Paul the Traveler and Roman Citizen* (New York, 1898).

DERBENT, or **DERBEND**, dĕr-bĕnt′ (Pers. *Darband*, bond of the gate; Ar. *Bāb al-Abrāb*, gate of the gates, or *Bāb al-Kadīd;* Turk. *Demir-kapu*, gate of iron). A seaport town in the Caucasian Province of Daghestan, situated on the Caspian Sea and on the railway line from Baku to Petrovsk (Map: Russia, G 6). It is surrounded by strong walls and commanded by a citadel. The surrounding district abounds in gardens, fruit being the chief article of commerce. The harbor is unprotected and shallow for large vessels. The Caucasian or Derbend Wall, a line of fortifications of the sixth century, and formerly strengthened by high towers and formidable gates, begins in the vicinity of the town. Another interesting relic of antiquity in the vicinity is the monument of Kirk-Lar or 'forty heroes,' dating from the conquest of Daghestan by the Arabs in the seventh century. Derbend was taken by the Mongols in 1220, and, after many changes of masters, by the Russians in 1722. After the treaty of 1723 the town was returned to Persia, only to be formally annexed to Russia in 1813. Population, in 1897, 14,821.

DERBY, där′bĭ (Dan. *Derwentby*, *Deoraby*, near the Derwent, Lat. *Derventio*). A municipal borough and manufacturing town, the capital of Derbyshire, England, in the wide and fertile valley of the Derwent, thence navigable to the Trent, at the junction of the main branches of the Midland railway, 129 miles north-northwest of London, and 40 miles north-northeast of Birmingham (Map: England, E 4). The houses are mostly of brick and the public buildings of stone. The most notable of the latter are All Saints' Church with a beautiful Perpendicular tower 175 feet high, dating from the sixteenth century, the quaint little fourteenth-century chapel of Saint Mary-on-the-Bridge, the Roman Catholic Church of Saint Mary, built by Pugin, a large market hall and corn exchange. Derby sends two members to Parliament. It owns its water-supply, an electric-light plant, public baths and wash-houses, cemeteries, markets, and slaughter-houses. It maintains a technical school, a free library, museum, and art gallery. It also owns and operates its street railway system. The free grammar school founded in 1162 is one of the oldest institutions of its kind in England. There is also a large general infirmary. Derby is well situated for manufacture and trade, being connected by canals and railways with a great part of England. The Midland Railway has established large works here, which employ over 12,000 men. It has manufactures of silk, cotton, lace, hosiery, porcelain, and elastic fabrics. The first silk-mill in England was erected on an island in the Derwent in 1718 by John Lombe. There is a resident United States consular agent. Population, in 1891, 94,100; in 1901, 105,800; in 1905 (estimated), 122,207. Derby is the birthplace of Herbert Spencer, and Erasmus Darwin wrote many of his works and died here. Opposite Derby was the Roman station *Derventio*, which stood on the east bank of the river. Roman brass, silver, and gold coins have been found, as well as a Roman pavement, and the foundations of a Roman bridge. Derby was first incorporated in the reign of Henry I. It was the southernmost point reached by Charles Edward, the Young Pretender, in his attempted march to London in 1745.

DERBY, dẽr′bĭ. A city in New Haven County, Conn., 10 miles west of New Haven; at the confluence of the Naugatuck and Housatonic rivers, and on the New York, New Haven and Hartford Railroad (Map: Connecticut, C 4). An important industrial centre, its manufactures include pins, typewriting machines, pianos, organs, piano-players, heavy castings, engines, machinery, files, woolen underwear, corsets, hosiery, combs, hair-pins, curling-irons, keys, guns, and ammunition. There are many points of interest in the vicinity—Sentinel Hill, Indian Well, Lake Housatonic, Housatonic and Naugatuck rivers, and the Housatonic Dam, 25 feet high and a quarter of a mile in length. The government is administered by a mayor, elected biennially, and a unicameral city council. City meetings are held for the election of selectmen, to issue bonds, and for action on matters over which power is not vested in the common council. Population, in 1900, 7930. The town was settled about 1646, and was known as Paugassett until incorporated as Derby (from Derby, England) in 1675. It was the birthplace of Gen. David Humphreys, prominent in the Revolution. Until 1889 Ansonia was included within its limits. The city of Derby was formed in 1893 by the consolidation of the town of Derby and the borough of Birmingham, founded in 1834. Consult: Orcutt and Beardsley, *The History of the Old Town of Derby* (Springfield, 1880), and *The Town Records of Derby from 1655-1710* (Derby, 1901).

DERBY, dẽr′bĭ, or där′bĭ, Edward George Geoffrey Smith Stanley, fourteenth Earl of (1799-1869). An English statesman. He was born at Knowsley Park, in Lancashire, on March 29, 1799, was educated at Eton and at Christ Church, Oxford, and in 1820, immediately after leaving the university, he was made a member of Parliament. In 1830 he became Irish Secretary in the Whig Ministry of Earl Grey, and by his ability as a debater he rendered very material assistance in the passage of the Reform Bill of 1832. Among his Irish measures were the Education Act, establishing a national board, and admitting all children to the schools, but providing for Protestant religious instruction; the Irish Church Temporalities Act, abolishing ten bishoprics, and removing the grievances of first fruits and church rates; and a coercion bill for the trial of Irish rioters by courts-martial. This last measure rendered him unpopular with the advanced Liberals, and he was transferred to the Colonial Secretaryship in 1833. In that year he distinguished himself by securing the passage of the bill for the abolition of slavery in the West Indies. Becoming alarmed at the intention of the Whigs to appropriate the surplus of the Irish Church revenues to purposes of secular education, he left the party in 1834. He soon united with the Tories, and in 1841 he became Colonial Secretary in Peel's Ministry. This position he held until 1845, when he resigned because he was opposed to the repeal of the corn laws. He was the recognized head of the Protectionist opposition in the House of Lords, which he had entered as Baron Stanley in 1844, and soon became the leader of the Conservative Party. In 1851 he succeeded his father as Earl of Derby. In 1852 the first Derby Ministry was formed. But it was of short duration, as were also his second term of office (1858-59) and his third (1866-68), and Disraeli (q.v.) was the leading spirit in all of them. In 1868 he resigned the Premiership to Disraeli, and in the following year he died.

Derby was a typical Lancashire magnate of the old school. Traditionally Whig, he left that party because of his repugnance to the rising democracy. While not a statesman of the first rank, he was nevertheless possessed of great ability. His doctrine of free trade with the colonies alone anticipates Conservative doctrine of our own day, and to him, as well as to Disraeli, is due the transformation of the Tories into the modern Conservative Party. He was a debater of great ability, excelling especially in invective. His passages with O'Connell on the repeal of the Union and the disestablishment of the Irish Church are well known. He was a man of high scholarly attainments, who distinguished himself at the university, and was afterwards famous for his Latin speeches. He was elected chancellor of Oxford in 1852, and devoted the leisure of his later years to a metrical translation, or rather paraphrase, of the *Iliad* (published in 1864).

For Derby's speeches, consult: Hansard, *Parliamentary Debates* (London, 1803, et seq.). For his *Life*, Kebbel, *English Statesman Since the Peace of 1815: Derby* (London, 1869); and Saintsbury, in Reid, *Prime Ministers of Queen Victoria* (New York, 1892). Consult, also, Kebbel, *History of Toryism* (London, 1866); and Hamilton, in the *Dictionary of National Biography*, vol. liv. (London, 1898).

DERBY, Edward Henry Smith Stanley, fifteenth Earl of (1826-93). An English statesman. He studied at Rugby under Arnold, and at Trinity College, Cambridge, and from 1848 to 1869 sat in Parliament for King's Lynn. In 1852 he was appointed Under-Secretary for Foreign Affairs, in 1858 Secretary for the Colonies and the first Secretary of State for India, and in 1866 and 1874 became Secretary for Foreign Affairs. From 1882 to 1885 he was Secretary for the Colonies in Mr. Gladstone's second Administration. From 1891 until his death he was the chancellor of the University of London. He was a strong opponent of Irish Home Rule.

DERBY, dẽr′bĭ, George Horatio (1823-61). An American humorist, commonly known as

'John Phœnix,' born at Dedham, Mass. He graduated at West Point in 1846, and served in the Mexican War with gallantry. He was on the staff of the commanding general of the Department of the Pacific from 1854 to 1856, and did other engineering service, in the course of which he suffered the sunstroke that caused his death. He has a distinct place among American humorists for *Phœnixiana* (1855) and the *Squibob Papers* (1859), chiefly burlesque sketches of his official experiences full of delightful whimsicality, and important as introducing the rough but amusing humor of the Pacific Coast into American literature. Among his best squibs may be mentioned his *Musical Review Extraordinary* and his *New System of English Grammar.*

DERBY, ORVILLE ADELBERT (1851—). An American geologist, appointed chief of the geographical and geological surveys of São Paulo, Brazil, in 1886. He was born at Kelloggsville, N. Y., and graduated in 1873 at Cornell University, where he was instructor in geology from 1873 to 1875. He visited the Amazon Valley in 1870-71, and was connected with Prof. C. F. Hartt's geological commission of Brazil from 1875 to 1878. In 1878 he was appointed curator of the geological department of the National Museum. He published several papers on the geology and geography of Brazil, and headed many hydrographical, geographical, and geological surveys. In 1891 he published the first detailed topographical maps of South America based on actual surveys. In 1885 he organized the geographical and geological commission of São Paulo, serving as chief officer until 1904.

DERBY DAY, dẽr′bĭ *or* där′bĭ. The most important day in the calendar of English horse-racing events. The name is derived from the 'Derby Stakes' race, run on the second day (Wednesday) of the Epsom Summer Meeting, which takes place about the end of May, or, in rare instances, at the beginning of June. The race itself was instituted in 1780 by the Earl of Derby, whence the name. The course is 1 mile, 4 furlongs, and 29 yards in length; and, like all the great race-courses of England, is conducted under the rules and regulations of the Jockey Club. Originally, the weights carried were 112 pounds for colts and 109 pounds for fillies, but after several changes they are now permanently set at 126 pounds for colts and 121 pounds for fillies. Entries are usually made when the animals are yearlings, two years before the race takes place. The event owes its importance to the fact that the entries in the Derby race represent the highest development of race-horse breeding, besides affording an indication of the probable winners of the subsequent important races. The proximity of the race-course (Epsom Downs, Surrey) to London makes possible the tremendous and heterogeneous attendance which is so conspicuous a feature of the race, and which, together with its value as a sporting event, has given the day its present importance. Parliament is adjourned over Derby Day, though of late not without protest on the part of a few of its members, and business generally is suspended as far as London is concerned. In America, the term Derby Day, preceded by the name of the track or 'meeting,' is frequently applied to the day on which the chief race of the year of such meeting is run—as, for instance, the Brighton Derby, run at Brighton Beach, L. I. See HORSE; HORSE-RACING.

DERBYSHIRE. An inland county of England, lying between Yorkshire on the north and Leicestershire on the south (Map: England, E 3). Its area is 1014 square miles. It is hilly in the north and level in the south, with a very fertile soil. The Derby Highlands, which reach their maximum altitude in the Peak, 1880 feet, and the Kinder Scout, 2088 feet, form the Peak District, noted for its beautiful scenery, especially along the valleys of the Derwent and the Wye. Matlock and Buxton, among the hills, are fashionable health resorts on account of their warm mineral springs. Throughout the county there are numerous Celtic and Roman remains, mediæval ruins of abbeys, monasteries, and feudal castles, and among the many handsome, noble residences are Haddon Hall and Chatsworth, the seat of the Duke of Devonshire. Derbyshire is more a manufacturing and mining than an agricultural county, though its agricultural industries are important. The chief towns are Derby, Buxton, and Belper. Population, in 1891, 425,472; in 1901, 504,610.

DERBYSHIRE NECK. See GOITRE.

DERBYSHIRE SPAR. A name given to the splendid crystals of fluorite found in Derbyshire, England.

DERCYL′LIDAS (Lat., from Gk. Δερκυλλίδας, *Derkyllidas*). A Spartan soldier of the fourth and third centuries B.C. He was sent in B.C. 411 to the Hellespont to arouse the cities to revolt against the supremacy of Athens, and in 399 received command of the army stationed in Asia for the defense of the Ionic Greeks against the Persians. He took advantage of the hostility existing between Pharnabazus (q.v.) and Tissaphernes (q.v.), concluded a truce with the latter, and successfully invaded Æolis, the satrapy of the former. In 398 he built a wall to guard the Thracian Chersonese against the inroads of the Thracians. He endeavored in 397, by threatening Caria, to obtain the independence of the Ionic Greeks, and in 396, when Agesilaus (q.v.) had arrived in Asia, was one of the commissioners for the arrangement of an armistice with Tissaphernes. In 394 he conveyed to Agesilaus and the Greek cities of Asia the tidings of the battle of Corinth.

DER′ELICT (Lat. *derelictus*, from *de-* + *relinquere*, to abandon). Personal property cast away or abandoned by the owner, especially at sea. The seizure or 'occupancy' of derelict property is one of the recognized modes of original, as distinguished from the derivative, acquisition of title. In order to constitute an article derelict, so as to make it available to the first person who chooses to make it his own, it is not sufficient that it should be lost, but it must have been deliberately cast away or abandoned, without expectation or intention of recovering it. Goods thrown away by a thief in his flight, known as *bona waviata*, are not properly derelict, inasmuch as he has no title to them. The same thing is true of treasure trove. The question of abandonment is one of fact, to be determined from the conduct of the owner at the time of the loss. A vessel or goods found abandoned on the high seas are presumed to be derelict, but not so personal property found without an occupant on land or even in a harbor or river; and the presumption in the former case may be rebutted by showing the circumstances under which the abandonment occurred. The owner of wreck, if not derelict, is entitled within one year to claim it from the possessor on paying salvage and the expenses incurred in rescuing the property. See Acquisition; Accretion; Salvage; Wreck. Consult: Schouler on *Personal Property* (3d ed., Boston, 1896); Maclachlan, *Treatise on the Law of Merchant Shipping* (4th ed., London, 1892).

DERENBOURG, de-räɴ'bo͞or', Hartwig (1844—). A French Orientalist. He was born in Paris, a son of Joseph Derenbourg, and studied there and at the universities of Göttingen and Leipzig. On his return to Paris in 1867 he was employed in the Bibliothèque Nationale, and edited the catalogue of Arabic manuscripts. From 1875 he taught Arabic at the Ecole des Langues Orientales, was made professor there in 1879, and professor of Islamitic science at the Ecole des Hautes Etudes in 1886. His numerous publications include: *De Pluralium Linguæ Arabicæ et Æthiopicæ Formarum Origine et Indole* (Göttingen, 1867); *Le Diwan de Nabigâ Dhobyâni* (Paris, 1869); *Le livre de Sîbawaihi, texte arabe* (Paris, 1881-89), his principal work; *Chrestomathie élémentaire de l'arabe littéral* (ib., 1885); *Ousâma Ibn Mounkidh, un émir syrien au premier siècle des croisades* (1886-93); *La science des religions et l'Islamisme* (1886); *Les monuments Sabéens et Himyarites de la Bibliothèque Nationale* (1891).

DERENBOURG, Joseph (1811-95). A German-French Orientalist. He was born at Mainz of Jewish parents, his real name having been Dernburg. He studied at the universities of Giessen and Bonn, and, having spent some years at Amsterdam as private tutor, went to Paris in 1839 to complete his study of Oriental languages. In 1852 he was made corrector at the Imprimerie Nationale, in special charge of the Oriental publications. He was elected a member of the Academy of Inscriptions in 1871, and was appointed to the chair of Talmudic science at the Ecole Pratique des Hautes Etudes in 1877. His principal work is the *Essai sur l'histoire et la géographie de la Palestine* (1867). He edited the fables of Lokman (1846), with an introductory essay on their Christian origin, and the Makamat of Hariri, *Les séances de Hariri* (1847-53), in collaboration with Reinaud. His other works comprise: *Manuel du lecteur* (1871); *Notes épigraphiques* (1877); *Deux versions hébraïques du livre de Kalîlâh et Dimnâh* (1881); *Le livre des parterres fleuris* (1886); *Commentaire de Maimonide sur la Mischnah Seder Tohorot* (Berlin, 1886-91); besides many contributions to the *Journal Asiatique*, the *Revue Critique*, and other periodicals.

DE REPUB'LICA (Lat., On the State). A philosophical treatise on politics by Cicero (c.54-51 B.C.), in six books. It was lost during the Middle Ages, but fragments were found on a palimpsest early in the nineteenth century. About one-third of the work is preserved. including the *Somnium Scipionis*, with which it closed.

DE RESZKE, Edouard and Jean. See Reszke, Edouard de; and Reszke, Jean de.

DERFFLINGER, dĕr'flĭng-er, Georg, Baron von (1606-95). A field-marshal of Brandenburg, born at Neuhofen, Austria. He entered the Swedish service during the reign of Gustavus Adolphus, and advanced to the rank of colonel. In 1642 he was sent by Torstenson to negotiate an alliance with George Rákóczy in Transylvania. Several years afterwards he resigned from the Swedish service and entered that of the Elector of Brandenburg. He fought with distinction in the wars against Poland, Denmark, Sweden, and France, and was promoted to the rank of lieutenant-general, in consideration of his splendid assault on Warsaw, in 1656, field-marshal (1670), and military Governor of Pomerania (1678). The formation and training of the cavalry of the electorate were due chiefly to his initiative, and the celebrated battle of Fehrbellin (June 18, 1675) was decided by the brilliant cavalry charge which he executed at the head of 6500 horsemen. The conquest of Stralsund and Rügen (1678), where at the age of seventy-two he led the attack in person, and the subsequent campaign against Sweden, were also among the military feats of this officer. The military greatness of Prussia in later times was undoubtedly due to the influence exerted upon the army of Brandenburg by men like Derfflinger.

DERG, dĕrk, Lough (Ir., clear lake). The name of two Irish lakes. (1) The larger is an expansion of the river Shannon, between Tipperary on the southeast and Galway and Clare on the northwest (Map: Ireland, D 2). It is 24 miles long from northeast to southwest, and 2 to 6 miles broad. Its surface is about 100 feet above the sea; its average depth, 35 feet. It has several islands. (2) A lake in the south of Donegal County, on the border of Tyrone. It is 3 miles long, 2½ miles broad, and has many islets and rocks. On its wild shores are hills rising 700 to 1200 feet. Saint's Island possesses the remains of a priory founded about the year 600, and was the scene of Saint Patrick's vision of purgatory. The place of penance on Station Island was for years the most celebrated spot for pilgrimage in Ireland.

DERIVATION. See Etymology.

DERIVATION (Lat. *derivatio*, a leading or turning off, from *de*, away, off + *rivus*, small stream, channel, canal). An old term in medicine, descriptive of an old method of treating disease, by which it was formerly supposed that the *materies morbi*, or 'matter of the disease,' was drained away through some channel established for it by artificial means, as when a blister is applied over an inflamed lung, or a discharge from the bowels established in a case of dropsy. The term is little used now, though applicable to some treatment as far as results are concerned.

DERMA, or **DERMIS**. See Integument.

DERMAT'OGEN (Gk. *δέρμα*, *derma*, skin, bark + root *γεν-*, *gen-*, to produce, generate; cf. *γένος*, *genos*, stock, race, origin). A single layer of superficial cells at growing tips, which gives rise to the epidermis. A true dermatogen is found only in the seed-plants (spermatophytes) and in the roots of fern-plants (pteridophytes). See Anatomy.

DER'MATOL'OGY (Gk. *δέρμα*, *derma*, skin + *λόγος*, *logos*, discourse, science). The science of the management of the skin and of its diseases. See Skin.

DERMAT'OPHYTES (Gk. *δέρμα*, *derma*, skin, *φυτόν*, *phyton*, growth, plant). Cryptogamic vegetable growths, varieties of Torula, inhabiting the cuticle or epidermis, and giving rise to some forms of skin diseases, as favus, pityriasis, ringworm (qq.v.), etc.

DERMES'TID BEETLES (Gk. *δέρμα*, *derma*, skin + *ἐσθίειν*, *esthiein*, to eat, literally 'skin-eater'). A family (Dermestidæ) of small or moderately sized and very destructive beetles. Both the adults and the larvæ feed on a variety of animal and vegetable substances, making them museum and household pests, preserved meats, woolens, furs, feathers, silk, and even drugs being exposed to their depredations. The adults, which are oval or elongate and vari-colored, feign death when disturbed, falling to the ground, ventral surface upward, and lying stiff with folded legs. The adults may frequently be found outdoors on flowers, and on the windows of infested houses. The larvæ, which are short and woolly or fuzzy, do far more damage than the adults. There are 300 to 400 species in the family. The most common of them in the United States are the larder or bacon beetle (see Bacon-Beetle), the carpet-beetle (q.v.), the museum pest, and the raspberry-worm (qq.v.). One form lives on cobwebs, feeding perhaps on the remains of insects caught there, and possibly on the web itself. Species of the genus Attagenus are responsible for a curious and beautiful kind of felting, resembling moleskin, of pillows and bed-ticks, which often puzzles housekeepers. The fumes of carbon bisulphide, applied in a tight inclosure, are fatal both to the beetle and the larvæ. Carbon bisulphide, however, is very explosive, and its fumes are harmful to man, and hence it should be used with caution. Benzine and naphtha are helpful in keeping these pests from entering stored goods.

DERNA, dĕr'nȧ, or **DERN**. A town of Barca, Northern Africa, situated at the mouth of a ravine, one mile from the Mediterranean (Map: Africa, Tripoli, G 1). In 1805 it was captured by a force of natives and Americans, led by General Eaton. Population, estimated at 2000.

DERNBURG, dĕrn'bo͞ork, Heinrich (1829—). A German legal scholar, born in Mainz. He was educated at the universities of Heidelberg and Giessen, was appointed a professor at Zurich in 1852, and at Halle in 1862. In 1873 he became professor of Roman law and Prussian common law at Berlin. He represented the University of Halle in the Prussian Upper House from 1866, and the University of Berlin from 1873. His publications include: *Die Institutionen des Gajus* (1869), and a *Lehrbuch des preussischen Privatrechts* (3 vols., 1871-80; 5th ed. 1893 et seq.), his most important work.

DE ROSNY, de rō'nā', Léon. See Rosny, Léon de.

DÉROULÈDE, dâ'ro͞o'lâd', Paul (1846—). A chauvinistic French poet and political agitator, born in Paris. He wrote *Chants du soldat* (1872); *Nouveaux chants du soldat* (1875); *Refrains militaires* (1888); *Chants du paysan* (1894); and *Poésies militaires* (1896). Déroulède has also written a patriotic cantata, *Vive la France* (1880); a religious drama, *La Moabite* (1880); and a patriotic play, *L'Hetman* (1877). Recent patriotic historical works are *Messire du Guesclin* (1895) and *La mort de Hoche* (1897). Dèroulède fought in the war of 1870-71 and subsequently, as the head of the Patriotic League, carried on a passionate agitation for a war of revenge against Germany. He was a leader of the anti-Dreyfus forces. He was in the Chamber of Deputies from 1893 to 1895 and in 1898-99. In 1900 he was found guilty of plotting against the republic and sentenced to exile for ten years, but returned to France in 1905 under a law of amnesty. He stood unsuccessfully as a candidate for election to the Chamber of Deputies in May, 1906.

DERRÉCAGAIX, dĕr'râ'kâ'gâ', Victor Bernard (1833—). A French soldier, born in Bayonne. He studied at the College of Saint Cyr, served in the Crimea in 1854 as lieutenant of infantry, and rose to be lieutenant-colonel in 1880. In 1883 he was appointed professor at the Ecole de Guerre, and in 1888 became chief of the geographical service of the army. He was promoted in 1895 to be a general of division. He is known for his topographical surveys of France, and for his works on military affairs—*Etude sur les états-majors des armées étrangères* (1869); *Histoire de la guerre de 1870* (1871); *La guerre moderne* (1885); and others.

DERRICK (from *Derrick*, a Tyburn hangman). A device for hoisting heavy loads and conveying them short distances. In ordinary nomenclature the distinction between derricks and cranes is considerably confused. The most common form of derrick consists of a vertical mast pivoted at its bottom into a fixed bed-plate and maintained in an upright position by guy-cables or other forms of stays, which radiate from a loose collar or spider encircling a pin in the top of the mast; of a boom hinged to this vertical mast near the bottom so that it may be made to assume various inclinations relative to the mast, and of the tackle and motors necessary to impart motion to the boom and mast and to the load which they carry. The load is suspended from the end of the boom by ropes which pass through a block and thence to the motor at the foot of the mast. The end of the boom is sustained by a cable passing through a block at the top of the mast and thence to the motor at its foot. The mast is revolved on its bottom pivot by means of a horizontal wheel around which a rope passes or by some other simple mechanism. The motions permitted by such a derrick are the vertical hoisting of the load, a swinging motion through the rotation of the shaft on its pivot, and a radial motion due to the change in inclination of the boom. Perhaps the most salient distinction between a derrick and a crane is that the boom of the derrick is hinged at its connection with the mast, while the jib of a crane is always rigidly connected with the upright member. If this distinction is maintained in classifying these two sorts of hoisting and conveying devices, however, it throws many devices now called derricks into the class of cranes. Derricks of the type described are extensively employed in quarrying, masonry work, excavating, and building erection. One of the largest derricks in the world is located at the Avondale Marble Quarries at Chester, Pa., and will hoist a load of 100 tons. The general dimensions of this derrick are as follows: Length of mast, 105½ feet; length of boom, 90½ feet; the mast is 31 inches square at the base and 26 inches in diameter at the top; and the boom is 25 inches and 21 inches in diameter at the two ends. The main hoisting-rope is 1½ inches in diameter and is made of crucible-steel wire. The mast and boom are Oregon fir. For 'floating derricks,' see CRANE.

DERRINGER, dĕr′rĭn-jĕr. A kind of short-barreled pistol, of very large calibre, very effective at short range. It derives its name from its inventor, an American gunsmith.

DER′RY. See LONDONDERRY.

DERVISH (Pers. *darvish,* poor, Avesta *driyu,* poor; the Persian equivalent of Ar. *faqir*, poor, ascetic). In Mohammedan countries a class of persons who are supposed to lead a peculiarly religious life, resembling in some respects the monks of Christendom. There are many different brotherhoods or orders. D'Ohsson, in his work on the Ottoman Empire, enumerates thirty-two, but the list is far from being complete. The period of establishment extends from A.D. 768 down to the last century, in which several new ones were established. They live mostly in convents, well endowed, both in land and money, called Tekkije, and are under a chief with the title of 'Sheik,' i.e. 'elder.' Some of the monks are married and allowed to live out of the monastery, but most sleep there some nights each week. Their devotional exercises consist in meetings for worship, frequent prayers, religious dances, and mortifications. The main devotional exercise, however, is the *zikr*, which is conducted differently in the different orders. It consists in the repetition of certain formulas, accompanied by violent motions until the dervish falls into a cataleptic state. As the convent does not provide them with clothing, they are obliged to work more or less. Three of the orders, the Bastamiyah, the Nakshbandiyah, and the Bakhtashiyah, claim to be descended from the original order established by the first caliph Abu-Bekr. Of these, the Nakshbandiyah are the most numerous. In their convents at Cairo and Constantinople and elsewhere, they have services on Wednesdays and Sundays, when about twenty performers take part in the *zikr* ceremony. The orders are spread throughout the Mohammedan world and in India. The most popular one is that of the Muradiyah, to which most of the fakirs belong who crowd the bazaars of India. The Rufaiyah (founded 1182) in India, Turkey, and Egypt, are known for their severe discipline and the castigations of their bodies. They are commonly known as the 'Howling Dervishes.' Another popular order is that of the Kalandariyah, known also as the 'Wandering Dervishes,' among whom constant traveling is an obligation. The Maulawiyah constitute the order familiarly known as the 'Dancing Dervishes.' At their *zikr* they follow one another about the floor in regular order, each with eyes closed and arms extended, turning around in a sort of waltz and intoning a monotonous chant. Each order has its own rules and principles, extending to the dress and the method of wearing the hair and beard. In many of the orders the initiation rites are most elaborate.

Tradition refers the origin of these orders to the earliest times of Islam, making the caliphs Abu-Bekr and Ali found such brotherhoods. While it is certain that Mohammed advocated poverty, it is more probable that dervishes arose later, when Mohammedanism came into contact with other religions, such as Persian and Hindu. Many Mohammedan princes have held dervishes in high respect and bestowed rich endowments on their establishments, and they are still held in high veneration by the people. For a time, however, they were regarded with suspicion by the Government, since they decline to obey any authority except the religious head of the order. Hence Mahmud II. in 1826 attempted to destroy the orders, actually putting to death some of the leaders. His attempt, however, failed.

Besides those dervishes regularly affiliated with an order, there are individuals who travel from place to place, and by feats of strength or sleight-of-hand manage to earn a livelihood. Consult: Lane, *The Modern Egyptians* (London, 1836); Brown, *The Dervishes* (Philadelphia, 1868); Malcolm, *History of Persia* (London, 1829); D'Ohsson, *History of the Ottoman Empire* (Paris, 1787-90).

DERVISH PASHA, dĕr-vēsh′ pȧ-shä′, IBRAHIM (1817-96). A Turkish soldier and statesman, born in Constantinople. He attained the rank of general of division in 1862 and successfully commanded the Turkish forces in the campaign against Montenegro. He was subsequently placed in charge of the civilized military administration of Albania and Syria. He became Governor-General of Bosnia and Herzegovina, but, failing to quell the insurrection of 1875, was recalled. In the Russo-Turkish War of 1877-78 he distinguished himself by his successful defense of Batum. As Governor-General of Albania in 1880-81 he reëstablished Ottoman authority and brought as prisoners to Constantinople the leaders of the revolutionary league.

DERWENT, dĕr′wĕnt (clear water). One of the principal rivers of Tasmania. It issues from Lake Saint Clare, in the centre of the island; flows tortuously toward the southeast; passes by Hobart, the capital; and after a course of 130 miles enters Storm Bay, in D'Entrecasteaux Channel, by an estuary four miles wide (Map: Tasmania, C 5). The Derwent is navigable as far as Hobart for ships of any burden.

DERWENTWATER, dĕr′wĕnt-wą′tĕr, LAKE. An oval sheet of water in the south of Cumberland, England. one of the most beautiful lakes of that county (Map: England, C 2). It is three miles long, one mile broad, 72 feet deep, and 222 feet above the sea. Its banks are rocky and abrupt, and behind them rise rocky mountains, one of which, the Cat Bells, is 1448 feet high; another, Lodore, has a waterfall of 100 feet. Derwentwater is an enlargement of the Derwent River, which flows into the Irish Sea at Workington. It has several wooded isles, besides a remarkable floating isle—a mass of earthy matter, six feet thick, varying in size in different years from an acre to a few square rods, covered with vegetation and full of gas-bubbles which buoy it on the surface of the water. The lake abounds in trout, pike, perch, and eels.

DERWENTWATER, JAMES RADCLIFFE or RADCLYFFE, third and last Earl of (1689-1716). An English Roman Catholic nobleman, one of the leaders in the Rebellion of 1715. He came of an ancient Northumberland family, and was born in London, June 28, 1689. He received his education in France, and at his father's death in 1705 became Earl of Derwentwater. He joined the Pretender in 1715 with seventy retainers, and, after fighting with great heroism, was taken prisoner at Preston. He was convicted of treason, and, despite all efforts to save him, was beheaded on Tower Hill, February 24, 1716, his rank, youth, amiability, bravery, and simplicity of motives exciting widespread sympathy. His estates were forfeited and given to Greenwich Hospital.

DERZHAVIN, dyĕr-zhä′vên, Gavril Romanovitch (1743-1816). A celebrated Russian lyric poet. Born of a noble family at Kazan, he entered there the newly opened gymnasium in 1759, joined the ranks of the Preobrazhensky Guard Regiment in 1782, became lieutenant-captain in 1773, and later entered the civil service. His ode, *Felitsa* (1782), in which he extolled Catharine II., attracted her attention, and through her influence he received many promotions; he was Governor of Olonetz in 1784, of Tambov in 1785, Secretary of State in 1791, and Senator in 1793. Catharine's successor, Paul, appointed him president of the Board of Commerce in 1796, and Alexander I. made him Minister of Justice in 1802; but he retired to private life in 1803. He was the greatest and most original poet before Pushkin, and is best known as the 'Singer of Catharine,' his works forming a poetic chronicle of her achievements. So far from being a Court poet, he was a really deep and sincere admirer of the northern Semiramis, with her liberal reforms and democratic leanings, as evidenced in her daily life and correspondence with Voltaire and Diderot. Though occupying a more exalted position after her death, he never wrote anything about the other monarchs that in power and loftiness of conception could even approach his odes about Catharine and the events of her reign. His language is quite modern in its purity and comparative freedom from Church-Slavonic expressions. Its chief characteristics are vigor united with pliancy, and a vivid imagery that sometimes verges on the hyperbolic. He was the first to introduce every-day expressions into odes, thus bringing down the grand style to modern realism. As a critic says: "The poet takes the ground of contemporaneousness, and the solemn ode becomes the echo of the day. No Russian poet before stood so near to his period as did Derzhavin." Of his many poems, the ode *God* is the best known the world over, having been translated into most Occidental languages and even into Japanese and Chinese. The best edition of his works appeared in nine volumes (Saint Petersburg, 1864-83), with a commentary and biography by the academician J. Grot.

DÉS, dāsh, or **DÉES MAGYAROS**, dâs mŏd′yŏ-rŏs. The capital of the Province of Szolnok-Doboka, Transylvania, Hungary, at the confluence of the Great and Little Szamos, 37½ miles northeast of Klausenburg by rail. Its chief public buildings are the fifteenth-century Gothic Reformed Church, the Thokoly palace, the handsome town hall and municipal theatre. A sixteenth-century tower is a remnant of the ancient fortifications. Distilling and salt-mines are among the principal industries. Population, in 1900, 9888.

DESAGUADERO, dâ-sä′gwȧ-dä′rô (Sp., outlet). A river of Bolivia, the outlet of Lake Titicaca. After a southeast course of 190 miles, it empties into the land-locked lake of Aullagas, near the town of Oruro (Map: Bolivia, D 7). It is the loftiest stream of any length on the entire American continent, its source being 12,650 feet high.

DESAIX DE VEYGOUX, de-sâ′ or de-zâ′ de vâ′gōō′, Louis Charles Antoine (1768-1800). A French general of the First Republic, born August 17, 1768, at Saint Hilaire d'Ayat. He studied at the military school of Effiat, and in 1783 was made sub-lieutenant in a Breton regiment. He was in sympathy with the revolutionists, though he deprecated their violence, and in 1792 he was appointed aide to Prince Victor de Broglie, then commanding the Army of the Rhine. In 1793-94 he was made a general of brigade and then of division. He commanded the right wing of the Army of the Sambre and Meuse under Jourdan in 1795, and in the following year was again in the Army of the Rhine and Moselle, under Moreau, commanding the left wing in Moreau's famous retreat through the Black Forest. To Desaix was intrusted the fortress of Kehl, the only stronghold upon the right bank of the Rhine which the French retained after this retreat. The fort was in ruins, but behind its imperfect defenses Desaix held out against an Austrian army for two months, only surrendering in January, 1797, when his ammunition was exhausted. In the spring he was sent to Italy, where Bonaparte, recognizing his strong qualities, took pains to attach him to himself. Desaix accompanied the Egyptian expedition and there won his brightest laurels in the conquest of Upper Egypt from the Mamelukes under Murad Bey, after an eight months' campaign. By his equitable administration of the country after the conquest he won from the Arabs the title of 'the Just Sultan.' Returning to France at the command of Bonaparte in 1799 he joined the latter in Italy and was given the command of two divisions of reserves. This force, in June, 1800, was sent to Genoa on detached service, but in response to the sound of the distant fighting at Marengo (June 14), Desaix, by a sudden inspiration, returned, arriving just as Bonaparte was about to yield the field to Melas. Desaix saved the day by a vigorous attack with his divisions, but he was shot and instantly killed while leading the charge. He was an intrepid soldier, a skillful commander, and the idol of his troops. His body was embalmed and placed in the Monastery of Saint Bernard. A statue has been raised in his honor in Paris. Consult Becker, *Etudes historiques sur le général Desaix* (Clermont, 1852).

DE SANCTIS, dâ säṉk′tês, Francesco (1817-83). An Italian literary critic and statesman. He was born at Morra Irpino, and at an early age devoted himself to the study of literature and philosophy. He completed his education in the renowned institute of the Marchese Basilio Puoti, and when barely eighteen years of age entered upon the career of teaching. For two years he taught in the military Collegio della Nunziatella at Naples, and then founded a private school of his own which speedily won the highest reputation. His critical lectures on the classic and Italian poets attracted a multitude of students. Having held office in the Department of Public Instruction under the Revolutionary Government of 1848, he was arrested on the restoration of the Bourbons, and for three years kept in close confinement in the Castello dell' Ovo at Naples. On his release he took refuge in Malta, and thence went to Turin, where his original and eloquent lectures on the *Divina commedia* commanded universal admiration, and led to his being called, in 1856, to the Polytechnic Institute at Zurich as professor of æsthetics and Italian literature. In 1860 he was made Minister of Public Instruction at Naples, and held the same office for the Kingdom of Italy three times—in 1861-62, under Cavour and Ricasoli; in 1878, under Cairoli; and again in 1879-80, under the administration of Cairoli-Depretis. As a member of the Italian Chamber of Deputies, after 1861, he was a partisan of the Moderate Liberals. On his first retirement from public office, in 1862, he resumed his profession of teaching at Naples, where he also founded and edited the journal *L'Italia*. In 1871 he was appointed professor at the University of Naples.

De Sanctis exercised considerable influence on contemporaneous Italian literature as a critic, but even more as a teacher, giving a new impetus to literary criticism in Italy. His writings are few, but of the highest order. Foremost among them is to be mentioned his *Storia della letteratura italiana* (3d ed. 1879). Besides this, he published: *Saggi critici* (1868; 4th ed. 1881); *Saggio critico sul Petrarca* (1869); *Nuovi saggi critici* (1872). After his death were published: *Studio su Giacomo Leopardi* (1885); *La letteratura italiana nel secolo XIX*. (1897); *Scritti varii inediti* (1898).

DE SANCTIS, Luigi (1808-69). An Italian theologian. A distinguished prelate in Rome, he was converted by the study of the Bible, and in 1847 fled to Malta, where he became a Protestant. From 1852 he worked as a preacher of the Waldensian congregation in Turin; became, in 1854, the head of the 'Chiesa Libera,' a radical offshoot of the Waldensians, which body he, however, joined again in 1864, accepting a professorship at their seminary in Florence, where he also established the Protestant periodical *Eco della Verità*.

DESARGUES, de-zärg', Gérard (1593-1662). A French mathematician. He was born in Lyons, and is chiefly known as one of the founders of modern geometry. Poncelet called him "the Monge of his century." Desargues and Pascal introduced the method of perspective, and treated the conic sections (q.v.) as projections of a circle. Two important theorems are attributed to Desargues, one of which forms the basis of his remarkable theory of homological figures. To Desargues is further due the theory of involution and of transversals, the conception that a straight line is a curve closed at infinity, and the definition of parallels as lines intersecting at infinity. The works of Desargues have mostly been lost, but the titles of the chief ones are known. They are as follows: *Méthode universelle de mettre en perspective les objets donnés réellement ou en devis, avec leurs proportions, mesures, éloignement, sans employer aucun point qui soit hors du champ de l'ouvrage* (1636); *Brouillon project d'une atteinte aux événements des recontres d'un cône avec un plan* (1639); *Brouillon project . . . pour la coupe des pierres* (1640). For his biography, consult Poudra, in Desargues's *Œuvres* (Paris, 1864).

DESART, de-zärt', William Ulick O'Connor Cuffe, fourth Earl of (1845-98). An English novelist. He was born in London, and was educated at Eton and at Bonn. After serving as page of honor to Queen Victoria, he became lieutenant in the Grenadier Guards (1862) and then captain (1865). Much of his later life was passed in Canada. He died September 15, 1898. He was the author of many novels, among which are: *Only a Woman's Love* (1868); *Children of Nature*, a story of modern London, which caused a sensation (1877); *Kelverdale* (1878); *The Honorable Ella* (1879); *Mervyne O'Connor and Other Tales* (1880); *Lord and Lady Piccadilly* (1887); *Love and Pride on an Iceberg, and Other Tales* (1887); and *The Raid of the Detrimental* (1897).

DÉSAUGIERS, då'zô'zhyå', Marc Antoine Madeline (1772-1827). A French writer of songs and vaudevilles. He was born at Fréjus, and was a son of the composer Marc Antoine Désaugiers (1742-93). He was educated for the ministry at the Collège Mazarin, Paris, but discontinued his studies in order to visit Santo Domingo. His attitude here during the negro insurrection imperiled his life, and he was compelled to seek refuge on an American steamer bound for Baltimore. In that city he devoted himself for several years to pianoforte instruction. Upon his return to France he acquired a considerable reputation as a writer of songs and vaudevilles, and subsequently became director of the Vaudeville Theatre of Paris, which position he retained until 1827. Several of his songs are still popular. Among them are *La treille de la sincérité* and *Paris à cinq heures du matin*. The complete works of this amiable and charming writer, who is held by some to surpass even Béranger, were published in Paris in 1827, under the title, *Chansons et poésies diverses*. One of his most humorous productions is the one-act vaudeville entitled *Milord Go, ou le dix-huit Brumaire* (1804).

DESAULT, de-zō', Pierre Joseph (1744-95). A brilliant French anatomist and surgeon. He became professor of anatomy in Paris in 1776, at the age of thirty-two; was admitted to membership in the corporation of surgeons in the same year, and subsequently held various positions of honor. In 1782 he was appointed surgeon-major to the De la Charité Hospital, and came to be regarded as one of the ablest surgeons of his time. He next went to the Hôtel Dieu, and after Moreau's death the surgical department of the hospital was intrusted to him. There he instituted a clinical school of surgery—the first of its type—attracting pupils from all over Europe. He introduced system and precision into surgery, and made many valuable improvements in the instruments used in that profession. His pupil, the celebrated Bichat (q.v.), published his *Œuvres chirurgicales* (1798-1803). Consult Labrune, *Etude sur la vie et les travaux de Desault* (Besançon, 1867).

DESBARRES, då'bär', or **DES BARRES**, Joseph Frederick Walsh (1722-1824). An English military engineer and hydrographer. He graduated at the Royal Military Academy of Woolwich, and was sent to America, where he was engaged in the French and Indian War as lieutenant of artillery. He was in the expedition against Louisburg, and in the siege of Quebec was aide to Wolfe, who fell into his arms when he received his death wound. For some years afterwards Desbarres was charged with important engineering surveys in Nova Scotia, Newfoundland, and other British colonies, with a view of establishing a chain of military posts. He was also engaged in correcting old and making new charts of the North American coast, which were published in two volumes in 1777, under the title of the *Atlantic Neptune.* In 1784 he became Governor of the island of Cape Breton, and soon afterwards began to build the town of Sydney, where he opened the coal trade. In 1805, at the age of eighty-three, he was made Lieutenant-Governor and commander-in-chief of Prince Edward Island, and served until 1813.

DESBORDES-VALMORE, dȧ'bôrd' vȧl'môr', Marceline Félicité Josèphe (1785-1859). A French poet, born at Douai. She began public life as a singer in comic opera (1801), but soon left the stage, and from 1819 till 1843 published sentimental verses of much sweetness and pathos, collected under the suggestive titles: *Elégies et romances* (1818); *Elégies et poésies nouvelles* (1824); *Les pleurs* (1833); *Pauvres fleurs!* (1839); *Bouquets et prières* (1843); *Poésies de l'enfance.* She wrote also some indifferent stories. Her popular song "S'il avait su" is in most anthologies. For an elaborate study of her poems, consult Sainte-Beuve, *Nouveaux lundis,* vol. xii. (Paris, 1869).

DESCAMPS, dȧ'käɴ', Jean Baptiste (1711—91). A French author and painter, born at Dunkirk. He studied painting under Largillière, and afterwards founded an academy of painting, sculpture, and architecture in Rouen, in 1741, where he was professor for many years. There are pictures by him in the Rouen Museum and at the Ecole des Beaux-Arts in Paris. His subjects were usually peasant scenes, but he also painted a series of episodes from the life of Louis XV. Descamps is best remembered for his *Vies des peintres flamands, allemands et hollandais* (4 vols., 1753-63), a work formerly much esteemed, but not very critical.

DESCANT, dȧ'skäɴ' or **DISCANT** (OF. *descant*, ML. *discantus*, from *dis-*, asunder, apart + *cantus*, song, singing). A term which in mediæval times was applied to contrary motion in polyphony, as distinguished from the parallel motion of the parts of the so-called *organum.* In modern part-music, the highest part, the treble or soprano voice.

DESCARTES, dȧ'kärt', René; Lat. Renatus Cartesius (1596-1650). One of the most distinguished modern philosophers, sometimes called "the father of modern philosophy." He was born at La Haye, in Touraine, and was sent at the age of eight years to the Jesuit College at La Flèche, where he soon became distinguished for his keenness of intellect, and made great and rapid progress in languages, mathematics, and astronomy. It was not long, however, before he became dissatisfied with the doctrines and method of scholasticism, and felt it impossible to acquiesce in what had hitherto been regarded as knowledge. The first thing that he did after leaving college was to abandon books and endeavor to efface from his mind all that he had hitherto been taught, that it might be free to receive the impressions of truth, whencesoever they should come. In pursuance of his plan he resolved to travel, and soon entered the army as a volunteer, serving successively under Maurice of Nassau, son of William of Orange, and under Tilly and Buguoy. However, the life of a soldier contributed little to his main object, and he quitted the army in 1621. After making journeys in different directions, he at last retired in 1629 to Holland, where he prepared most of his works, attracted many disciples, and at the same time became involved in several learned controversies, especially with the theologians. Although he loved independence, yet in 1649 he accepted an invitation addressed to him by Queen Christina to go to Sweden. His willingness to leave Holland was partly occasioned by his anxiety to escape from the hostility of his enemies. He died only a few months after his arrival at the Court of Queen Christina. Sixteen years later his body was brought to Paris and buried in the Church of Saint Geneviève-du-Mont.

The grand object toward which Descartes directed his endeavors was the attainment of a firm philosophical conviction. The way whereby he sought to attain this end is explained in the discourse on method (*Discours de la méthode*), published in 1637. This small but extremely interesting and important treatise contains a history of the inner life of the author, tracing the progress of his mental development from its commencement in early years to the point where it resulted in his resolution to hold nothing for true until he had ascertained the grounds of certitude. The author in the same treatise also explains the practical rules whereby he resolved to be guided while in this state of suspended belief, and by the observance of which he hoped to arrive at absolute certainty, if indeed it were at all attainable. The result of his inquiries, so conducted, he exhibited more particularly in his *Meditationes de Prima Philosophia* (1641) and the *Principia Philosophiæ* (1644). He begins philosophy anew with a resolve to doubt everything; for might not our beliefs be the result of the mischievous working of some evil demon? One fact he found indubitable—his doubting and his thinking. But in order to think he must exist; hence, in the fundamental fact of psychic experience he believed that he came into knowing contact with ultimate reality—a process of reasoning which Augustine had followed before him. In other words, he could not doubt that he felt and thought, and therefore he could not doubt that *he,* the feeler, the thinker, existed. This relation between consciousness and existence he expressed by the memorable words, *Cogito, ergo sum* ("I think, therefore I exist"). Upon examining the criterion for the certitude of this knowledge, he found it in the clearness and distinctness of his thought about himself. Hence he argued that whatever is as clearly and distinctly thought as self-consciousness must be true. Among these clear and distinct thoughts he first recognized the idea of God as the absolutely perfect being. This idea, he reasoned, could not be formed in our minds by ourselves, for the imperfect can never originate the perfect; it must be innate—i.e. part of the original structure of our understanding, and implanted there by the perfect being himself. Hence, from the existence of the idea of perfection, Descartes inferred the existence of God as the originator of it; he inferred it also from the mere nature of the idea, because the idea of perfection involves existence—a form of the so-called 'ontological argument.' But if God exist, then we have a guarantee of the previously determined ground of certitude, for God the perfect being cannot deceive, and therefore whatever our consciousness clearly testifies may be implicitly believed. This Cartesian position that the truth of a proposition is tested by its clear and distinct intelligibility is the principle of rationalism (q.v.).

One of the most fundamental general principles of the philosophical system of Descartes is the essential difference between spirit and matter—thinking and extended substances — a difference so great, according to Descartes, that they can exert no influence upon each other. Hence, in order to account for the correspondence between material and spiritual phenomena, he was obliged to have recourse to a constant coöperation (*concursus*) on the part of God — a doctrine which gave rise subsequently to the system called occasionalism (q.v.), the principle of which was that body and mind do not really affect each other, God being always the true cause of the apparent or occasional influence of one on the other. This doctrine received its complete development in the preëstablished harmony of Leibnitz (q.v.). In Descartes's thought it resulted merely in a strenuous insistence upon the differences between primary and secondary qualities (q.v.). Descartes maintained also that the lower animals belong merely to the world of extension, being unconscious automata.

Descartes did not confine his attention to mental philosophy, but devoted himself systematically to the explanation of the properties of the bodies composing the material universe. In this department his reforms amounted to a revolution, though many of his explanations of physical phenomena are purely *a priori* and quite absurd. His corpuscular philosophy—in which he endeavored to explain all the appearances of the material world simply by the motion of the ultimate particles of bodies—was a great advance on the system held up to that time, according to which special qualities and powers were assumed to account for every phenomenon. It was in pure mathematics, however, that Descartes achieved the greatest and most lasting results, especially by his invention of the analytic geometry, which is known from his name as Cartesian. In developing this branch of mathematics he had in mind, not the revolutionizing of geometry, but the elucidation of algebra by means of geometric intuition and concepts. He intended to establish a universal mathematic, to which algebra, arithmetic, and geometry (with its applications) should be entirely subordinate. He discarded Vieta's improvements in algebraic symbolism, introduced the present plan of representing known and unknown quantities, gave standing to the present system of exponents, placed the theory of negative quantities on a satisfactory basis, and set forth without demonstration the well-known rule for finding the limit of the number of positive and negative roots of an equation through inspection of the variations in the signs. While his expectations were, in one sense, not fulfilled, he nevertheless succeeded in imparting a powerful impulse to the progress of mathematics, and in giving to the science its modern trend. The establishment of a correspondence between geometry and analysis has been of incalculable assistance to both, and Descartes's invention may be said to constitute the point of departure of modern mathematics. In 1637 he published at Leyden a treatise entitled *Discours de la méthode pour bien conduire sa raison et chercher la vérité dans les sciences* (Eng. trans. 1850; recent ed., Chicago, 1899). This was followed in the same year by three appendices entitled, *La dioptrique, Les météores*, and *La géométrie*. The new mathematical discipline was set forth entirely in the *Géométrie*. The first part shows how arithmetical operations may be represented geometrically by taking a certain unit of length, in which lay the sole novelty of the plan. The second part shows how to trace algebraic (which he calls geometric) and transcendental (which he calls mechanical) curves, explaining the use of coördinates, and setting forth the general scheme (now discarded) of classification of curves according to the order of their equations. The third part treats of the theory of equations. The appearance of the *Géométrie* placed Descartes foremost among the mathematicians of his time.

His works in Latin were published at Amsterdam (1650). Modern editions are those by Cousin (Paris, 1824-26), by Garnier (Paris, 1834-35), by Aimé Martin (Paris, 1882). English translations of portions have been made by Veitch (Edinburgh, 1880), by Lowndes (London, 1878), and by Torrey (New York, 1892). Consult: Mahaffy, *Descartes* (Edinburgh, 1880); Millet, *Descartes, sa vie, ses travaux, etc.* (Paris, 1867); Fouillé, *Descartes* (Paris, 1893); Fischer, *Geschichte der neuern Philosophie*, vol. i. (Heidelberg, 1897); Bontroux, *L'imagination et les mathématiques selon Descartes* (Paris, 1900); Iverach, *Descartes, Spinoza, and the New Philosophy* (New York, 1904); Hoffman, *René Descartes* (Stuttgart, 1905); Haldane, *Descartes, His Life and Times* (London, 1905).

DESCARTES'S RULE OF SIGNS. According to this rule no numerical algebraic equation can have more positive roots than it has changes of sign from $+$ to $-$, and from $-$ to $+$, in the terms of the first member. By substituting $(-x)$ for (x) in $f(x) = 0$, the law may be applied to the case of negative roots. It is often possible to detect the existence of imaginary roots in equations by the application of this rule; for if it should happen that the sum of the greatest possible number of positive roots, added to the greatest possible number of negative roots, is less than the degree of the equation, we are sure of the existence of imaginary roots. The rule also bears Harriot's name, being given in his *Artis Analyticæ Praxis* (London, 1631). Consult: Burnside and Panton, *Theory of Equations* (Dublin, 1899-1901); Matthiessen, *Grundzüge der antiken und modernen Algebra der litteralen Gleichungen* (2d ed., Leipzig, 1896).

DESCAVES, dā'käv', LUCIEN (1861—). French novelist and playwright, born in Paris. His novels include *Le calvaire d'Héloise Pajadou* (1882); *Les sous-offs* (1889); *Les emmurés* (1894); and *La colonne* (1901). For the stage he wrote *La Clairière* (1899), with Donnay, and *L'Attentat* (1906), with Capus.

DESCENDANTS (from Lat. *descendere*, to descend, from *de*, down + *scandere*, to climb, Skt. *skand*, to spring). The issue of an individual, including all who have proceeded or descended from the issue of his body in any generation or degree. They take precedence over collateral relatives and ascendants (q.v.) in the inheritance of the property of a deceased ancestor. See COLLATERALS; CONSANGUINITY; DESCENT; HEIRS.

DESCENT. The transmission of real property by operation of law to the heir or heirs of one who dies intestate. It is a principle common to most if not all legal systems, that the property of a decedent, if not otherwise disposed of by him, shall pass in a fixed line of descent to those related to him by ties of blood. Under some systems, as that of Rome, no distinction was made between the two classes of property which we distinguish as real and personal, the whole passing, along with the liabilities of the owner, to a personal representative, and this has been the nature of descent generally, both in ancient and in modern nations. In the common-law system of England and the United States, however, a different principle has prevailed, only the personal property passing to the representative of the deceased, the real property devolving upon a lineal descendant, who became known as the heir. The personal representative was not necessarily a descendant, nor even related by any ties of consanguinity to the decedent, and the use of the term 'descent' was, therefore, confined to the devolution of the real property—the terms 'administration' and 'distribution' being employed to describe the corresponding disposition made of the personal property after the owner's death. The transmission of the real property to a different individual from the one whose title, as personal representative, was affected with the obligation to pay the decedent's debts, was a consequence of the feudal system, and was due, among other things, to the necessity of holding the lands together, free from claims on the part of others than the feudal lords of whom the lands were held.

The exceptional and peculiar character of the law of land at the common law, due to its complete absorption in the feudal system, is strikingly exemplified in the history of the doctrine of inheritance. There was at first no general recognition of the right to transmit freehold lands by descent, nor to alienate them without the consent of the lord of whom they were held, and the right to dispose of one's real estate by will was not conceded until the reign of Henry VIII. The right of inheritance, once acquired, was strictly limited to freeholds which were in terms granted to a man and his heirs, and did not extend to such as were granted to a man absolutely, but without an express limitation to heirs. The latter, therefore, fell into the category of life estates, while the quality of heritability became the chief characteristic of the estate known as a fee. Thenceforth freehold estates were classified as 'freeholds of inheritance' and 'freeholds not of inheritance.' It is with the former, only, that the law of descent has to do. The right of free alienation of lands held in fee was not acquired until the quality of heritability had come to be considered an essential characteristic of such lands, and such alienation was long regarded as an infringement upon the expectant rights of the heir, as well as upon the reserved rights of the lord of whom the fee was held. To-day, however, no fee can exist without possessing both the quality of free alienability and that of heritability within the limits prescribed by the laws of descent, and an attempt to create a fee which shall lack either of these characteristics is ineffectual and void.

The exigencies of the feudal system determined the course as well as the fact of descent at common law. The importance of holding an estate together, in the hands of a single heir, and that a male, nearest in blood to the decedent, fixed the canons of descent as they existed in England from the twelfth to the nineteenth century. Originally, it is true, and down to the time of Glanville (twelfth century), lands held by the tenure of free and common socage were governed by different rules from those which regulated the inheritance of military fees, or lands held by knight's service, and on the ancestor's death were divided among all his sons equally; but long before the time of Littleton this distinction had disappeared and all lands held in fee simple came under the operation of the feudal rules.

Briefly stated, these rules were as follows: (1) Inheritances shall lineally descend to the issue of the person who last died actually seized thereof, *in infinitum*, but shall never lineally ascend. A father or mother cannot inherit directly from a son or daughter. (2) The male issue shall be admitted before the female, to the total exclusion of the latter. (3) Where there are two or more males in equal degree of consanguinity to the ancestor, the eldest only shall inherit; but there being no male of equal degree, the females inherit all together. (4) The lineal descendants *in infinitum* of any person deceased, who, if he had survived, would have been the heir, shall represent their ancestor; that is, shall stand in the same place in the line of descent as he would have occupied, if living. Thus, the issue, whether male or female, of the eldest son will be preferred to the younger son or the daughter of the deceased ancestor. (5) On failure of lineal descendants, or issue, of the person last actually seized of the lands, the inheritance shall pass to his collateral relations of the blood of the first purchaser (i.e. of the first in the line of ancestors to transmit it by descent, having acquired it himself in some other way), on the same terms as to preference of males, primogeniture, etc., as it would have passed to issue, if there had been any. Thus an elder brother, or his issue, will take the inheritance to the exclusion of sisters and younger brothers. (6) The collateral heir of the person last seized must be his next collateral kinsman of the whole blood. The half blood is wholly excluded from the line of descent. (7) In collateral inheritances the male stocks shall be preferred to the female; that is, kindred derived from the blood of the male ancestors, however remote, shall be admitted before those from the blood of the female, however near, unless, indeed, the lands have descended from a female ancestor, in which case the rule is reversed and the female stock preferred to the male.

These common-law rules of descent have been changed in some important respects by the Inheritance Act (3 and 4 Will. IV., c. 106). The famous rule of primogeniture, embodied in the second canon and the first part of the third, remains unchanged, notwithstanding its complete rejection by the United States and the self-governing colonies of Great Britain, as well as by the nations of Continental Europe. The second half of the second canon and the seventh also remain unaltered. The first has been changed by deriving the descent from the last purchaser instead of the person last actually seized, and by admitting lineal ancestors in default of lineal descendants and in preference to collateral heirs. The sixth canon has also been altered by admitting collateral relations of the half blood in default of relations of the whole blood in the same degree.

So far as they are applicable, these common-law rules of descent govern all common law, as distinguished from customary inheritances, including the descent of fee-tail estates. These are the result of legislation of the end of the thirteenth century, and, as they are expressly limited to heirs of the body, that is to lineal descendants only, the rules relating to collateral inheritance have no application to them. Even the canons governing lineal inheritances, however, may be varied by the form of the fee tail, as a fee tail special, which confines the inheritance to the issue of a certain wife, a fee tail male (which may be general or special) which limits descent to the male issue, etc.

So, too, while the common-law rules have to a great extent come to be applied to copyhold estates, whose qualities are largely determined by local custom, they have no application whatever to certain other classes of customary estates. Thus lands held by the custom of gavelkind (q.v.), which is the prevailing tenure in Kent, and which occurs elsewhere, are still governed by the old rule of socage tenure, and pass to the sons of the decedent equally, while in the case of lands held by the ancient tenure of borough-English (q.v.) the common-law rule of primogeniture is reversed, and the inheritance passes to the youngest son. And it may be said, in general, that, in many manors and boroughs in England, the course of descent of certain lands may still be governed by local customs of great antiquity, which have successfully resisted the encroachments of the feudalized common-law doctrine.

In the United States there is much diversity in the law of inheritance. The course of descent is everywhere regulated by legislative enactment, and the statutes of the several States must be consulted by any one who desires to master its details. But there is a general and essential uniformity in the outlines of the law governing the matter throughout the nation.

In the first place, the law of the descent of real property has generally been kept distinct from that of the distribution of personal property, and the heir from the personal representative. In the second place, the descent of real property is still confined to those who are of the blood of the decedent, excepting in a few States in which the wife and the husband have been placed in the line of inheritance. In the third place, the principle of priority according to the degree of consanguinity has been preserved, the relatives of one degree not being entitled to share in the inheritance if there is any representative of a higher degree living. In the fourth place, the rules in accordance with which the degree of consanguinity of collaterals is computed have generally in the United States been charged to those of the civil law, being the aggregate of both parties from the common ancestor.

On the other hand, as has been said before, the rule of primogeniture has been universally rejected in the United States, and, with it, the feudal preference of the male over the female heir. All the children of the decedent, and all the relatives of equal degree, share alike, usually as tenants in common, without distinction of age or sex. Generally, also, the disability of the half blood has been wholly or partially removed, and half brothers and sisters permitted to share equally with those of full blood, or, as now in England, admitted immediately after the latter. In all States the father and mother, and in some States all lineal ancestors are admitted to the inheritance, usually immediately after lineal descendants and before the collaterals. The principle of representation has also been retained, but in general the descent is traced, not from the person last actually seized, as at common law, nor from the last purchaser, as under the present English statute, but from the person last entitled. The canons of descent, as given above from Blackstone, do not in terms exclude illegitimate children, but no principle of the common law is better established than the rule which denies the right of inheritance to a bastard; only persons born in lawful wedlock are within the legal limits of consanguinity, and no others are capable of lineal or collateral inheritance. This principle has been maintained in all its rigor in England, and has been generally observed in the inheritance laws of the United States, but with the following exceptions and modifications. In most of the States illegitimate children inherit from the mother equally with legitimate children, in one State (New York) only in case the mother has no legitimate issue, and in one (Kansas) from the father also, if his recognition of them is notorious. In many of the States the milder rule of the civil and canon laws, that the subsequent marriage of the parents legitimates previously born children, has been adopted.

It remains to be said that the law of descent of a given jurisdiction is immutable and not to be varied by any form of grant or conveyance. An estate may, indeed, be taken out of its operation by previous conveyance or by last will and testament, but if real property be left undisposed of it passes according to an iron law of inheritance and not otherwise. No limitation of an estate to a different class of heirs, no provision excluding an individual or a class of individuals, has any validity. To attempt to create a different line of descent from that established by law, as by granting lands to A and his male heirs only, or to B and his paternal line only, is to undertake the creation of a novel kind of estate, unknown to the law, and therefore not to be tolerated. Such a conveyance, if it creates an estate of inheritance at all, is at once subjected to the established rules of descent and the particular restrictions imposed by the donor disregarded. The only exception to this principle is the case of the fee-tail estate, referred to above, and that is only an apparent and not a real exception, the qualities of the various kinds of fees tail being as clearly defined as are those of the ordinary estate in fee simple. Consult: Blackstone, *Commentaries on the Laws of England;* Williams, *Principles of the Law of Real Property* (17th (International) ed., London and Boston, 1894; 19th Eng. ed., 1901); Jenks, *Modern Land Law* (Oxford, 1899); Digby, *An Introduction to the History of the Law of Real Property* (5th ed., Oxford, 1899); Pollock and Maitland, *History of English Law* (2d ed., Cambridge and Boston, 1899); Washburn, *Law of Real Property* (6th ed., Boston, 1902). See Distribution; Executor; Heir; Inheritance; and the titles of the various kinds of estates, as Fee Simple; Fee Tail, etc.

DESCENT CAST. A doctrine of the ancient common law in England, whereby the right of entry of a person who had been disseized of lands was barred by the death of the adverse holder and the descent of the lands to the latter's heir. Entry upon lands was formerly by far the most convenient and expeditious method of recovering them from a disseizor, but so important in legal effect was the fact of actual possession by him, however wrongful, that he was invested with an inheritable title, and the passing of this title by descent operated as a limitation upon the right of entry of him who had been disseized. In the technical language of the common law, "a descent cast tolls (i.e. bars) entry." This effect of a descent cast might be avoided by the procedure known as making continual claim, which consisted in an annual demand for possession made by the claimant upon the disseizor. If such claim was made within a year and a day of the disseizor's death, the right of entry of the disseizee was saved. A descent cast had no effect upon the right of a claimant of lands to pursue his remedies by action, but only upon the summary process of entry. See Entry, Right of; Disseizin; Limitation.

DESCHAMPS, dȧ'shäN', Emile de Saint Amand (1791-1871). A French poet, born at Bourges. To forward the cause of romanticism, he founded with Victor Hugo *La Muse Française* (1824). To this journal he contributed verses and stories signed 'Un Jeune Moraliste.' Four years afterwards he collected and published *Etudes françaises et étrangères* (1828), consisting of poems and translations. The preface of this book, an enthusiastic defense of the Romantic School, won the approval of Goethe. His other works consist of translations, plays, poetry, and essays. He was one of the first to see and promote the spread of romanticism.

DESCHAMPS, Eustache (called Morel). A French poet of the fourteenth century. He was born at Vertus, studied law at Orléans, and was appointed bailli of Senlis by the Emperor Charles V. His life was that of a popular trouvère. His verse, like most of that of his time, is quite artificial, and possesses chiefly an historical value. One of his ballads is addressed to Chaucer. In addition to ballads and rondeaus, he wrote a *Miroir de mariage* in 13,000 lines, and *De l'art de dicter.*

DESCHANEL, dȧ'shȧ'nĕl', Emile Auguste Etienne Martin (1819-1904). A French critic and author, born in Paris. He became professor of rhetoric at the Normal School there, and the contributor of numerous critical articles to the *Revue des Deux Mondes.* His essays on *Catholicisme et socialisme* (1850) brought him into difficulties with the Government; he was arrested and finally obliged to leave France. He took refuge in Belgium, where he met Victor Hugo. On his return to his native country, Deschanel became one of the editors of the *Journal des Débats* (1859). In 1881 he was made professor of modern literature in the Collège de France, and in the same year was elected a Senator. His works include: *Les courtisanes grecques* (1859); *Histoire de la conversation* (1857); *Etudes sur Aristophane* (1867); *Le romantisme des classiques* (1882-86); *Racine* (1884).

DESCHANEL, Paul Eugène Louis (1856 —). A French statesman and author, born at Brussels. He was secretary to two ministers of France, and entered the administration as vice-prefect in 1877. As an orator in the Chamber of Deputies, to which body he was first elected in 1885, he displayed great eloquence. From 1898 to 1902 he was president of the Chamber. In 1899 he was elected to the French Academy. He wrote *La question du Tonkin* (1883); *La politique française en Océanie* (1884); *Les intérêts français dans l'océan pacifique* (1885); *La décentralisation* (1895); *La question sociale* (1898); *Politique intérieure et etrangère* (1906).

DESCHUTES, dȧ'sho͞ot' (Fr., the falls). A river rising in the Cascade range and flowing north by east through Crook and Wasco counties, Oregon, to the Columbia River (Map: Oregon, D 5). It is about 320 miles long, and for 140 miles of its course it cuts into the great lava bed of the Northwest. The river has made a canyon, ranging from 1000 to 2500 feet in depth and exposing on its sides at least 130 layers of lava one above another.

DES CLOIZEAUX, dȧ klwä'zō', Alfred Louis Olivier Legrand (1817-97). A French mineralogist, born at Beauvais (Oise). After scientific study and travel he was appointed assistant instructor in the Ecole Centrale des Arts et Manufactures, and subsequently lecturer at the Ecole Normale. He was elected in 1869 to the Academy of Sciences. In 1876 he became professor of mineralogy at the Muséum d'Histoire Naturelle. He made important investigations in regard to the optical properties of crystals, particularly with a view to establishing a basis for a crystallographic system and discovered the triclinic potash feldspar known as microclin ($KAl Si_3O_8$) and the circular polarization of cinnabar. He published *Leçons de cristallographie* (1861); a *Manuel de minéralogie* (vol. i., 1862; vol. ii., part i., 1874); and *Nouvelles recherches sur les propriétés optiques des cristaux* (1867).

DESCLOT, dĕ-sklō' (Desclos, Des Clot, Esclot, Sclot), Bernat. A Catalan historian in the latter half of the thirteenth century. He wrote a *Llibre del rey En Pere,* the oldest important composition in the Catalonian language. While as an historical narrative it is skillful and reliable, its chief interest is linguistic. The original text was first published and edited by Buchon under the title, *Chroniques étrangères relatives aux expéditions françaises pendant le treizième siècle* (Paris, 1841).

DESCRIPTIVE GEOMETRY. See Geometry; Monge.

DES'DEMO'NA. The young wife of Othello in Shakespeare's tragedy of the latter title, smothered by her jealous husband at the instigation of Iago. This is said to be the first character impersonated by an actress on the English stage.

DESDÉN CON EL DESDÉN, dās'dȧn kōn ĕl dās'dȧn, El (Sp., Disdain with Disdain). A play by Moreto, produced about the middle of the seventeenth century. It was translated into English by Westland Marston (1864), from the German version of Schreyvogel.

DESDICHADO, dĕs′dĭ-chä′dō (Sp., unfortunate). In Scott's novel *Ivanhoe*, the device adopted by the hero in the Ashby tournament.

DE SEN′ECTU′TE (Lat., On Old Age), or **CA′TO MA′JOR.** A popular essay by Cicero, applying the principles of philosophy to the endurance of the ills incident to old age. It was composed in B.C. 45 or 44, and is dedicated to Atticus. Scipio and Lælius are represented as meeting at the home of the elder Cato, in B.C. 150, and admiring the manner in which he bears his age.

DESERET, dĕz′ĕr-ĕt, STATE OF. The name given by the Mormons in 1849 to their settlement in the present State of Utah, *deseret* being a word taken from the Book of Mormon and meaning 'land of the honey-bee.' In September, 1850, Congress created the Territory of Utah, and the old name gradually fell into disuse. See UTAH; MORMONS.

DESERONTO, dĕz′ĕr-ŏn′tō. A town of Hastings County, Ontario, Can., the best harbor on the Bay of Quinte, an inlet of Lake Ontario, 130 miles east of Toronto (Map: Ontario, F 3). The Bay of Quinte Railway connects it with the Grand Trunk, the Canadian Pacific and the Central Ontario railroads. It has large lumber-mills, car works, chemical works, and other manufacturing industries, and is lighted by gas. The United States is represented by a consular agent. The beautiful Foresters' Island Park is near Deseronto. Population, in 1891, 3338; in 1901, 3527.

DESERT (Fr. *désert*, Lat. *desertum*, from *deserere*, to abandon, from *de*, from + *serere*, to bind). A region which supports little plant and animal life. As thus defined, the term includes all barren areas, whether their barrenness is caused by intense cold, lack of soil, or by insufficient moisture. Greenland, southern Patagonia, and the Arctic and Antarctic lands in general are deserts, determined as to character by their situation in high latitudes. In common usage, however, the term is limited to the great continental wastes, lying within the tropical and temperate zones, which are scantily watered by rains. The most extensive of these arid deserts are found in Asia, Africa, and Australia; they are much less prominent areally in North and South America, and in Europe they scarcely occur. The Sahara Desert is a part of an arid belt that reaches from the Atlantic coast across the northern limb of Africa to the Red Sea, and is continued through Arabia, Persia, Turkestan, Sungaria, and Mongolia, almost to the Pacific shores of Asia. The eastern extension of this belt, which is wider than the central portion, is known as the Desert of Gobi. In South Africa the Kalahari Desert occupies a large area between the Zambezi River on the north and the Orange and Limpopo rivers on the south. The arid regions of Australia are situated in the central part of the continent, and are of vast extent. The Atacama Desert, in northern Chile, and the Colorado Desert, in California, are of comparatively limited area, but they furnish perhaps the best illustrations of regions in America having an arid climate.

The arid deserts vary greatly in surface conformation, and often they are far from having the monotonous character which popular imagination has ascribed to them. The Sahara Desert consists essentially of a series of elevated plains rising in terraces to altitudes of several thousand feet. Within its compass there are sandy stretches with the surface formed by the winds into shifting dunes, and great areas underlain by stratified rocks, where the surface is strewn with boulders and has been deeply eroded by the rivers that existed in past ages. Oases are found at intervals in deserts wherever there are natural springs or mountains of sufficient height to cause precipitation. The date-palm and other food-plants may flourish here, while in the less favored regions the plant life is limited to representatives of the more hardy families, such as cacti and artemisia. The dryness of the desert climate and the scanty vegetation give rise to rock-sculpturing in columnar, tabular, and fantastic forms. Violent wind-storms, accompanied by whirlwinds, cloudless skies, extraordinary heat by day and rapid fall of the temperature at night, and an annual rainfall that varies from a few inches to an immeasurably small amount, are characteristic meteorological features.

The small rainfall, upon which the aridity of deserts depends, is due to the following causes: Prevalence of dry winds; isolation by mountain barriers along the borders; great distance from areas of evaporation, or oceans. The Sahara is an illustration of a desert caused by dry winds. In the northern part the prevailing winds blow from the northeast, and rain falls only in winter, when cyclonic storms from the Atlantic pass over the region. The moist winds that have their source in the Gulf of Guinea bring rain to the southern Sahara, but in small amounts only, as their temperature—and consequently their capacity for holding moisture—is increased before they reach far into the interior. A similar condition prevails in the Desert of Atacama, where the prevailing winds are from the south. When mountain ranges occupy the borders of a region the winds are deprived of their moisture before they pass beyond the interior slopes. Thus the Kalahari Desert receives a very small rainfall from the east winds, which bring an abundance to the region lying between the South African highlands and the Indian Ocean. In America the arid region of Nevada, Utah, and Arizona is shut in from the Pacific Ocean by mountains. Finally, desert conditions may prevail in regions situated at great distances from oceans, owing to the gradual precipitation of moisture as the winds travel inland. Consult Neumayr, *Erdgeschichte* (Leipzig, 1895), and Walther, *Das Gesetz der Wüstenbildung in Gegenwart und Vorzeit* (Berlin, 1900).

DESERTED VILLAGE, THE. A poem, partly descriptive and partly declamatory, by Goldsmith (1770), in which the poet moralizes somewhat tritely about the sadness of the growing luxury and the depopulation of pastoral retreats. See AUBURN.

DESERTION. A military offense consisting in abandoning the service with the intention of not returning to it. To prove this offense it is necessary to show absence without leave and the intention not to return. The maximum penalty for desertion in time of war is death. In time of peace it is dishonorable discharge and confinement at hard labor for five years. The United States Government pays a reward of $50 for the arrest, securing, and delivery of a deserter, and the statutes impose penalties and forfeitures. A soldier who has deserted, and whose period of service has elapsed prior to his apprehension, is handed over to the military authorities for trial and sentence by a military court-martial.

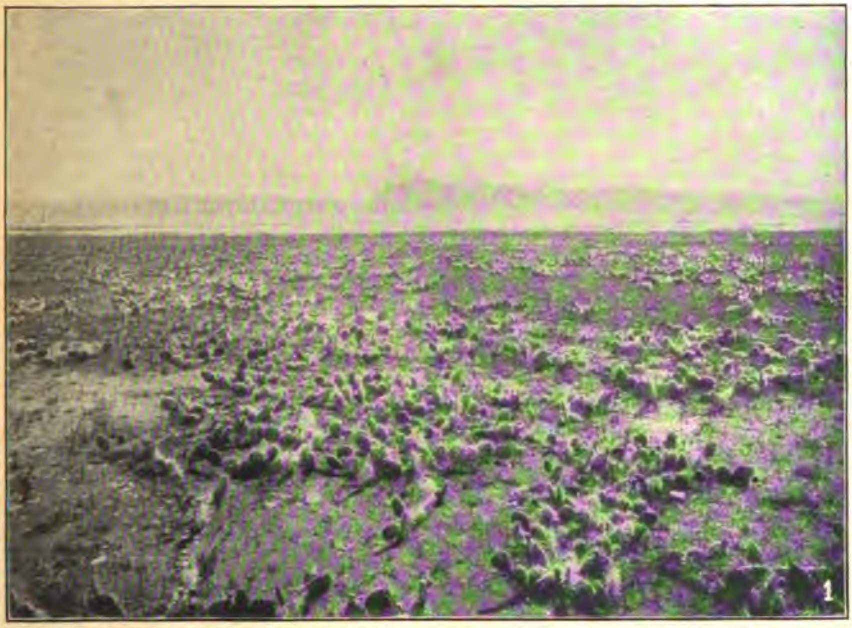
In the British Army desertion is a common offense, although in the majority of instances the soldier deserts to join another regiment immediately, in which case should he confess, or be discovered, he is tried by a district court-martial on the charge of fraudulent enlistment. Formerly the charge was 'desertion and fraudulent enlistment,' and up to 1879 the rule was to brand a deserter by tattooing him with the letter D, or B. C. (bad character). The punishment for a first offense is usually from three months' to two years' imprisonment in a military prison, and for succeeding offenses not more than five years may be inflicted. In Germany and Continental Europe generally, desertion in time of peace is difficult, and consequently infrequent, owing to the compulsory service system which prevails. Desertion in time of war is treated by all countries alike, death being the usual punishment. Desertion from the naval services of European nations is also treated with varying terms of imprisonment, or the death penalty, according to the nature and circumstances of the offense.

In the United States Navy, absence without leave, with a manifest intention not to return, is always regarded as *desertion*. Absence without leave, with the probability that the person does not intend to desert, is at first regarded as *straggling*, and at the expiration of ten days, if still absent, as *desertion*. In either case the commanding officer decides the point of intention and causes the person's name to be entered in the ship's logbook and marked on the paymaster's books as a *deserter*. Commanding officers are authorized to offer a reward not exceeding $20 for the recovery of a deserter, and one not exceeding $10 for the recovery of a straggler. In addition to the reward, there are paid such expenses attending their lodgment, subsistence, and traveling as have been fairly incurred. Any reward paid for the apprehension and necessary expenses of a straggler is charged to his account. The wages due a deserter are forfeited to the United States; if in debt to the Government at the time of his desertion, his effects are sold and the proceeds applied to liquidate it. The letter 'R' marked against a person's name on the ship's books signifies desertion, and no application for its removal is entertained unless the department is furnished with sufficient evidence that there was no intention to desert. Commanding officers of vessels at any United States naval station are not allowed to receive on board stragglers or deserters from other vessels, unless ordered so to do by the Bureau of Navigation, which has charge of the recruiting of the navy. In case of shipwreck or any other circumstance, except capture by an enemy, whereby any person belonging to a vessel in the navy becomes unavoidably separated from his command, it is his duty to proceed at once to the nearest ship, squadron, or station, and report himself to the officer in command. Should he not do so he is regarded as a deserter, and no claim for wages is allowed unless he can prove that he was prevented by circumstances beyond his control. The punishment of death, or such other punishment as a court-matial may adjudge, can be inflicted on any person in the naval service who in time of war deserts or entices others to desert. In the merchant service absence without leave for forty-eight hours is regarded as conclusive evidence of desertion.

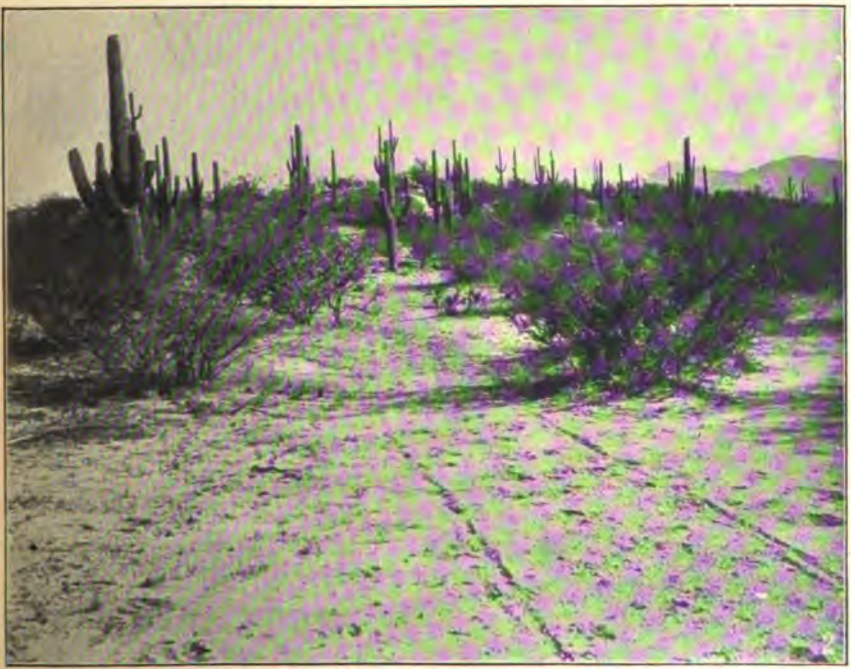
DESERTION. As applied to marital relations, the willful withdrawal of one of the married parties from the other, or the voluntary refusal of one to renew a suspended cohabitation without justification either in the non-consent of the other party or the wrongful conduct of that party. In most of the States in this country desertion, when willful and accompanied by lack of support on the part of the husband, is made by law a cause of divorce. The statutes of the several States define what may be considered desertion in each, and usually declare the length of time after which desertion will be deemed a good cause for divorce. This time varies from one year to five. It has been ruled that the intentional abandoning for the statutory period by a husband of the matrimonial companionship and intercourse would suffice to base a petition for divorce upon, even though during that time he had regularly contributed toward the support of the wife. A distinction must be made between desertion and mere absence; the former word always implies the non-assent of the person left and the violation by the deserter of some legal or moral duty. In cases of simple absence from the State the common law presumes the death of the person after the lapse of seven years, and in some States a shorter period than this is fixed by statute. Such absence may, like desertion, usually be made a ground for suit for divorce; but if the full period of absence has elapsed, a second marriage could not, under any circumstances, be made the cause of a prosecution for bigamy. In England under the present law the wife may demand a decree of judicial separation, coupled with an order for alimony, on account of willful desertion by the husband for two years without cause.

Consult the authorities referred to under HUSBAND AND WIFE. See ABANDONMENT; COHABITATION; CONJUGAL RIGHTS; DIVORCE; HUSBAND AND WIFE.

DESERT VEGETATION. Plants whose natural habitats are in deserts. They form one of the three great climatic groups of xerophytes, and show the typical xerophytic adaptations, which need but brief statement here. Most of the adaptations secure reduced transpiration—e.g. many plants show reduced leaves—or the leaves may even be wholly absent, as in some cacti; the deciduous habit is pronounced and reaches its highest expression in annuals, where the whole plant, so to speak, is shed during the dry season; anatomical structures, such as thick cuticles, coats of hair and also wax, protected stomata, etc., are highly developed. Adaptations which secure increased absorption are often found—e.g. root systems are highly developed—and absorptive hairs sometimes occur. Possibly the most characteristic of all desert adaptations are storage organs; succulent leaves and stems are particularly common, and there are many plants with fleshy underground stems (bulbs, tubers, etc.). The conditions that determine the nature of the vegetation are largely associated with the small amount of atmospheric moisture



1. **PRICKLY PEAR CACTUS** (Opuntia), covering the surface of an Arizona desert.



2. **ARTEMISIA AND CACTUS.** Scene in an Arizona desert, showing the bushy greasewood and sage-brush (Artemisia), and the columnar giant cactus (Cereus).

and its seasonal distribution. Most deserts are in semi-tropical regions, and hence the xerophytic conditions are accelerated by intense heat and light. The loss of water by evaporation rather than by drainage often gives rise to alkaline soils, which still further intensify the xerophytic characters. See Halophytes.

The vegetation of deserts is characterized by monotony rather than poverty, there being but few species that can endure the severe conditions. The plants are scattered so that the soil gives the landscape tone. In comparing desert plants with alpine and arctic plants, many ecological differences are seen; the most striking are the deciduous and succulent habits—habits particularly adapted to regions where drought is the result of heat. Floristically, deserts are noted for their endemism (q.v.), agreeing in this with alpine, but disagreeing with arctic vegetation. The endemism of deserts is due in part to their geographic isolation; mountains and other barriers commonly cut off deserts on all sides and prevent effective migration. However, another factor which favors endemism is the intense modification that desert plants have undergone as a result of the severe conditions. See Xerophyte.

DESÈZE, de-zâz′, Raymond, Count (1748-1828). A French lawyer. He was born and educated in Bordeaux, and in 1784 became established in Paris, where, together with Malesherbes and Trouchet, he was subsequently intrusted with the defense of Louis XVI. before the National Convention. Owing to the splendid oratory which he displayed on that occasion, he fell under suspicion of sympathizing with the royal cause, and was imprisoned until the fall of Robespierre. He did not avail himself of the opportunities of advancement offered him by Napoleon, but remained faithful to the House of Bourbon, and upon the installation of Louis XVIII. was appointed president of the Court of Cassation and grand warden of the royal orders.

DESFONTAINES, dâ′fôɴ′tân′, Pierre François Guyot (1685-1745). A French writer, born in Rouen. He entered the Jesuit Order, and became professor of rhetoric in Bourges. He wrote *Observations sur les écrites modernes* (1735), a shallow performance, yet so stinging that Voltaire bitterly replied in a *Critique des observations* (1738). Desfontaines countered with *La Voltairomanie* (1738), and so the quarrel went bravely on.

DESFONTAINES, René Louiche (1750-1833). A French botanist, born in Tremblay. In 1783 he was elected a member of the Academy of Sciences, by which he was commissioned in the same year to explore the Barbary States. In 1786 he became director of the botanical gardens in Paris, which he greatly improved. His works comprise: *Flora Atlantica* (1798-1800), compiled from his North African studies, and an *Histoire des arbres et arbrisseaux qui peuvent être cultivés en pleine terre sur le sol de la France* (1809).

DESFOSSÉS, dâ′fŏ′sâ′, Romain Joseph (1798-1864). A French admiral, born at Gouesnon (Finistère). In 1830 he was appointed captain, in which capacity he participated in the capture of Algiers. He was also a member of the expedition against Mexico in 1838, and commanded a vessel at San Juan d'Ulloa. In 1844 he arranged a treaty of commerce with Muscat and later conducted a punitive expedition against Madagascar. He became rear-admiral in 1848, Minister of Marine in 1849, vice-admiral and member of the admiralty council in 1853, and chairman of the Council of Naval Construction in 1854. As commander of the Mediterranean fleet, he bombarded the forts at the entrance to the Tetuan River in 1859 during the conflict between Morocco and Spain. In the following year he was promoted to the rank of admiral.

DESGENETTES, dâ′zhe-nĕt′, Nicolas René Dufriche (1762-1837). A French physician, born in Alençon. He was made physician-in-chief to the army in Italy in 1794, and occupied the same position in the Egyptian campaign. He went afterwards to Spain and Russia with the French army, and was present at Waterloo. His works include: *Histoire médicale de l'armée de l'orient* (Paris, 1802); *Souvenirs de la fin du XVIII. et du commencement du XIX. siècle* (1835-36).

DESGOFFE, dâ′gôf′, Blaise Alexandre (1830—). A French painter of still life. He was born in Paris, and studied there under Flandrin and Bougereau. His specialty is still life and objects of art, as, for example, vases and ivories from the collection in the Louvre, grouped together with, perhaps, fruit or flowers. Hamerton calls them 'precious copies of precious things.' In the Luxembourg there is the study of an "Amethyst Vase of the Sixteenth Century" (1859) by him, and in the Corcoran Gallery, in Washington, are his "Souvenirs of the Sixteenth and Seventeenth Centuries." He renders texture and material with peculiar felicity and microscopic detail.

DESHAYES, de-zâ′, Gérard Paul (1795-1875). A French geologist and conchologist. He was born in Nancy, studied in Strassburg and Paris, gave private lectures on geology in Paris, and in 1869 was appointed professor of conchology at the Muséum d'Histoire Naturelle. From 1839 to 1842 he was a member of the scientific commission to Algeria. He was one of the founders of the Geological Society of France, and frequently was elected its president. He assisted in the preparation of the statistical tables for Sir Charles Lyell's *Principles of Geology*, prepared the description of the recent and fossil mollusca obtained by the expedition to Morea, and began the compilation of a catalogue of the bivalve shells of the British Museum. It was as a student of fossil conchology that he was chiefly known. In this field he made important discoveries, and wrote his most noteworthy work, the *Description des animaux sans vertèbres découverts dans le bassin de Paris* (1857-67), the result of more than twenty years of painstaking study. He also published a *Traité élémentaire de conchyliologie* (1839-57).

DESHIMA, dâ-shē′mâ, or **DECIMA**, dâ-sē′-mâ (Japan., Fore Island). A fan-shaped artificial islet in front of the city of Nagasaki (q.v.), Japan, on which the Dutch traders had their factory and residence from 1639 to 1859. Here the Dutch for 220 years enjoyed the European monopoly of trade with Japan, the recipients of honors as well as the subjects of rigid rule. In the renaissance of Japan, Deshima played a most important part. Consult Griffis, *Religions of Japan* (London, 1895).

DESHNEFF, dĕsh-nyĕf′. The present official name of East Cape, the most northeasterly point in Asia, named after the Russian explorer Deshneff, who in 1648 discovered the strait named by Bering in 1728.

DESHOULIERES, dȧ′zōō′lyâr′, ANTOINETTE DU LIGIER DE LA GARDE (1638-94). A French poet, born in Paris. She was married very young (1651) to the Seigneur Deshoulières, a gentleman attached to the Prince of Condé, and for eight years was separated from her husband, he following the Prince into Flanders, where she rejoined him in 1667. After 1672 she lived in Paris, holding a kind of a salon and gathering about her the poets, philosophers, and wits of the day. She was the head of the cabal against Racine's *Phèdre* (1677), and composed a cruel epigram on the subject. Boileau, who never forgave her, has described her in his tenth satire. Her plays are weak, and her reputation rests upon several poems. The best edition of her works was published in 1749.

DESIC′CANTS (for etymology, see DESICCATION). In medicine, the substances with astringent properties which are serviceable in checking secretion from a mucous membrane or causing scabbing over or cicatrization of an ulcer or wound.

DES′ICCA′TION (Lat. *de*, down from, away + *siccare*, to dry). The process of drying by the employment of heat, dry air, or chemical agents which have an affinity for water. Examples of the class of *desiccants* or drying substances are fused chloride of calcium, quicklime, fused carbonate of potash, and oil of vitriol. The latter is employed by being placed in a separate vessel near the substance to be dried, and under a bell jar. For the use of this process to preserve foods, see FOODS, PRESERVATION OF.

DESIDERIO DA SETTIGNANO, dȧ′sê-dȧ′rê-ô dȧ sĕt′tê-nyä′nô, DI BARTOLOMMEO DI FRANCESCO (1428-64). An Italian sculptor, born at Settignano, near Florence. He was a pupil of Donatello, and died young, according to Vasari, who praises his works in the highest terms. His masterpiece, and one of the most beautiful of Florentine monuments of the fifteenth century, is the tomb of Carlo Marsuppini in the Church of Santa Croce. It represents Marsuppini lying on a sarcophagus while angels hold his portrait in the recess over the tomb, the group surrounded by wonderful ornate carving of the most exquisite detail and elaborate invention. He has that naïve sincerity, and a kind of meagreness of outline, so characteristic of the charming group of contemporary sculptors, Nino da Fiesole, Benedetto da Najano, and Andrea Rossellino, among whom he holds a peculiar place.

DES′IDE′RIUS. The last King (A.D. 756-774) of the Lombards (q.v.). He was besieged in Pavia by Charlemagne, and carried captive to France, where he died.

DESIGN (OF. *dessein*, from Lat. *de*, out + *signare*, to mark). A preliminary motive or sketch in either outline or color embodying the artist's thought in the illustration of a given theme. It is, however, more than a sketch, as the proportions, quantities, and spaces receive in a design more accurate treatment than would be bestowed in a sketch of the same subject. Designs are often carried to a great degree of completion, for it is sometimes necessary to make what is called a 'working design,' and so complete is this that the subject may be largely finished from the design by assistants. Such a design is usually of small size, destined for enlargement. In architecture, the term is applied to a drawing mathematically correct, but in which the effects to the eye which will ultimately be produced by distance and by light and shade are altogether ignored. See PLAN; ELEVATION.

DESIGN, SCHOOLS OF. In ancient times every master of an art or artistic industry was accustomed to impart the secrets of his craft to a number of pupils, who in return gave him such help as they could, working upon his masterpieces and learning by practice, under his supervision, his particular methods as well as the established traditions of the craft. In the Middle Ages this system of teaching was highly developed by the guilds, which controlled all the arts and trades, particularly in Florence and North Italy, in Germany and Flanders, and to a considerable extent also in France and England. The governing councils of these guilds regulated the terms of apprenticeship and the course of instruction, prescribed the tests for promotion from one grade to another, and instituted prize competitions to stimulate proficiency.

The Italian Renaissance, however, brought about a return from corporate to individual teaching. The guilds lost their controlling influence because of the personal preëminence of great artists like Perugino, Raphael, Da Vinci, and Michelangelo. These attracted groups of apprentice artists, who became their ardent disciples and imitators, reproducing often for a while not only the general style, but even the tricks and mannerisms of their masters. The term schools applied to these personal or local coteries and groups (School of Raphael, Venetian School) does not designate organized institutions at all.

The teaching of design by systematic instruction in organized schools is a comparatively modern idea. In the mediæval guilds, though the instruction was systematic in a measure, it was not given in schools or classes by specially appointed teachers. The first school of design to embody the new conception was the Royal Academy of Fine Arts, founded in 1648, in the reign of Louis XIV., in Paris. In this famous school, which has been in continuous operation ever since, five departments were established—those of painting, sculpture, architecture, engraving, and the cutting of gems and metals—in which instruction was given by regularly appointed professors, and proficiency encouraged by an elaborate system of awards, culminating in the Grand Prize of Rome in each department. See ECOLE DES BEAUX-ARTS; PRIX DE ROME.

In this school, to which France owes the training of many of her most illustrious artists, the first step was taken toward a scientific system of teaching design, by analyzing the training required into its essential elements, and teaching these separately by lectures and class-work, with test examinations. Composition and the theory of design, the history of art, perspective, costume, and classical archæology, and in architecture the orders and the elements of constructive science are the chief divisions of this teaching. The actual studio work has, however, from the first been conducted largely on the traditional lines of the apprenticeship system; and this is true of most of the schools of design, both European and American. A few have, on the other hand, endeavored to carry the scientific organization of the instruction into their studio work, as in the teaching of decorative design in the South Kensington Schools (see SOUTH KENSINGTON, ART SCHOOLS OF), and like institutions in England, and in the American schools of architecture.

Since the middle of the nineteenth century the number of schools of design has greatly increased in Europe, and in the United States since 1876; in both cases this has been largely due to the stimulus of international exhibitions. Those of 1851 and 1862 in London, and 1855 in Paris, opened the eyes of the English to the superiority of the French art industries, and led to the establishment of the South Kensington Museum and Schools of Art, and of scores of provincial schools for the training of skilled designers of textiles, ceramic wares, and other products of industry. Stimulated by the success of the British experiment, the various German States, the French Government, and many municipalities in both these countries, opened schools of design in the chief industrial centres. The marked feature of this movement, following the British precedent, was the recognition of the educational value of museums of industrial art.

In the United States the schools of design are, with but few exceptions, independent of municipal or State control, being managed by incorporated boards of trustees or influential art societies. Some of the museums of art are maintained or aided by the city or State; but in general both schools and museums have been founded by private munificence and are maintained without governmental aid. Besides the teaching in these special schools, drawing and elementary design are also taught in many public schools of Europe and America, as well as in evening classes conducted by the municipality or by philanthropic societies in the United States.

A broad distinction is generally made between Schools of the Fine Arts, in which painting, sculpture, and architecture are taught—sometimes also music and engraving—and 'Schools of Industrial Art,' which train their pupils for industrial design and the decorative arts. (See DECORATIVE ART.) In some cases the two kinds of training are offered in the same school, but this is rare. Architectural training, moreover, has in the United States been chiefly given in schools attached to universities or to technological institutions, and has been more thoroughly developed than any other branch of education in design in such schools as that of the Massachusetts Institute of Technology (1866), Cornell University (1869), Columbia University (1881), the University of Pennsylvania, and Harvard University.

In the modern schools of design free-hand drawing is universally recognized as the foundation upon which all the training must be based, since it involves the coördination of hand and eye. The grammar of design—that is, the theoretic principles of good decoration and the rules which express these—is taught by lectures or text-books and enforced by progressive exercises in design. Fertility and resource are cultivated by the study of the history of the decorative arts and of the examples of design in the museums, and the taste is trained both by this study and by the criticism of original designs prepared by the students. Finally there is added to these branches the detailed technical instruction necessary for each particular industry, such as stained-glass work, carpet-weaving, wall-paper making, pottery, and glass-work; and the graduate pupil is then qualified to enter the service of some industrial establishment or to make designs for sale to the manufacturers.

Among the conspicuous schools of design, besides those treated in special articles, there may be mentioned the Ecole Nationale et Spéciale des Arts Décoratifs, in Paris; the Berlin Bau Akademie, the Vienna Imperial Art Institute, the Art Schools of the Boston Museum of Fine Arts, the School of Applied Design for Women, and the Cooper Institute (q.v.), New York, the Chicago Art Institute, and the textile schools of Lowell and Philadelphia. See also ART STUDENTS' LEAGUE; ECOLE DES BEAUX-ARTS; NATIONAL ACADEMY OF DESIGN; ROYAL ACADEMY, LONDON; SOUTH KENSINGTON, ART SCHOOLS OF; SAINT LUKE, ACADEMY OF.

DÉSIRADE, dā'zē'räd' (Sp. *deseada*, desired). A small island in the West Indies, situated about eight miles northeast of Guadeloupe, of which it is a dependency (Map: West Indies, R 6). It is about seven miles long and one and one-half miles broad, and contains about 10 square miles; it is without a good harbor. Its population (1901) was 1399, chiefly emancipated slaves. The island was the first discovery of Columbus on his second voyage in 1493. He named it Deseada. It has been in the possession of the French since 1814.

DESIRE (OF. *desir*, Fr. *désir*, It. *desiro*, *desiderio*, from Lat. *desiderium*, desire, from *desiderare*, to desire). An imperfect volition. In both desire and volition an 'attractive' object or 'end' is set before consciousness; but in desire the individual is unable to attain the 'end,' unable even to attempt to attain it, while in volition he makes an effort to possess the object. He can hardly say that he is 'baffled' in desire, for that would imply the making of an attempt; and although the object appears as desirable, it does not appear as a thing to be sought after—at least, not for the moment. The inhibition is an integral part of the situation in which the desired object is presented. The central process in desire is, then, a motive shorn of its power. One may desire an object which has fallen out of reach; but since it is out of reach, one does not 'will' to get it. Only when the means of attainment come before the mind, or, at least, when the impossibility of reaching the object escapes the mind, does the volition arise; only then, that is, does one actually endeavor, strive to obtain the object. Until experience teaches that some things are impossible of attainment, the distinction between desire and volition does not arise. Thus the infant desires the moon, and at the same time stretches forth his hands to grasp it. He may still desire it after he has learned that it is an object in the sky; but he does not 'will' to possess it.

Some psychologists have given the word 'desire' a wider meaning than that just explained. They leave out the element of inhibition or inability, and assert that whenever an idea presents itself as a motive it arouses desire, whether the thing desired—e.g., a dinner or an ideal in moral conduct—is or is not realized. Under the first definition, desire is akin to wishing; under the second, it is a particular kind of conation (q.v.), an appetition, or an 'endeavor toward.' It is probably better to restrict the term to its narrower meaning, and to retain the element of inhibition, the lack of means by which the desire-consciousness might be changed into the volition-consciousness. Thus considered, a dissection of desire reveals a strong affective element, which may consist in pleasantness or unpleasantness. The thought of restriction is inherently unpleasant, but the unpleasantness may be overcome by the agreeable thought of the object. Over and above the affection and the ideas attended to, there is in desire a complex of organic sensations, and, in case the desire is sufficiently powerful—as in longing or yearning—a well-marked feeling of effort (q.v.). Consult: Bain, *Mental and Moral Science* (London, 1884); Wundt, *Human and Animal Psychology* (London, 1896); Stout, *Manual of Psychology* (London, 1899). See EMOTION; WILL.

DESJARDINS, då'zhär'dăN', ALPHONSE (1841—). A Canadian journalist and statesman. He was born at Terrebonne, P. Q.; was educated at Masson College and Nicolet Seminary, and was admitted to the bar in 1862. For some years he practiced law, but in 1868 abandoned it for journalism, and served on the editorial staff of *L'Ordre*, and as chief editor of *Le Nouveau Monde*. He took an active part in organizing the Canadian Papal Zouaves, sent to aid the Pope in 1868, and was one of the framers of the *Programme Catholique* (1871). For his services to the Roman Catholic Church he was created a knight of the Order of Pius IX. in 1872. In 1874 he entered the Dominion Parliament for Hochelaga and continued to represent that district until 1892. He has been Mayor of Montreal (1893), and has served also as Minister of Militia and of Public Works (1896).

DESJARDINS, MARTIN (1640-94). A French sculptor, whose real name was Martin van den Bogaert. He was born at Breda, in Holland, but went to France when very young, and studied in Paris with Houzeau, Van Obstal, and Buirette. He was made an academician in 1671, then professor (1675) and rector of the Royal Academy (1686). His works are in several of the Paris churches, and at Versailles. His masterpiece was the monument in honor of Louis XIV. in the Place de la Victoire (1686), but this was destroyed in 1792, and there are only fragments of it left in the Louvre and the Invalides. It represented the King on foot, crowned by Victory. There are colossal statues of Louis XIV. at Versailles and Lyons by Desjardins. His work, although academic in finish, has a good deal of dramatic feeling.

DESJARDINS, MICHEL ALBERT (1838-97). A French writer and politician, born at Beauvais (Oise). He studied at the University of Paris, and in 1871 was elected Deputy for Oise in the National Assembly. From 1873 to 1875 he was Under-Secretary in the Ministry of Public Instruction, and in 1875-76 held the same post in the Ministry of the Interior. In 1877 he was appointed to the chair of legislation and criminal procedure in the University of Paris. He published several juristically learned works, including: *Le pouvoir civil au concile de Trente* (1869); *Traité du vol dans les principales législations de l'antiquité et spécialement dans le droit romain* (1881); and *Code pénal russe* (1884).

DES'MAN (Sw. *desman råtta*, desman, from *desman*, musk + *råtta*, Ger. *Ratte*, rat). A large, aquatic, shrew-like mole of the genus Myogale and family Talpidæ, of which two species are known. They have completely webbed feet, the fore pair not adapted to digging and the hind pair enlarged into paddles, and a long and flexible proboscis. The best-known species is the Russian desman (*Myogale moschata*), which inhabits the margins of streams and lakes throughout southeastern Russia. It is about 16 inches long, including the tail, which is long and laterally compressed, forming a powerful swimming organ, acting as a sculling-oar; and it is clothed in soft, mole-like fur, blackish above and whitish beneath, and salable to furriers. An element of value in its fur is said to be the musky odor which clings to the fur, which is derived from a cluster of sebaceous anal glands, and which renders the flesh uneatable. Its home is an extensive burrow in the bank of a stream, opening underneath the water, in which the desman spends most of its time, and where it searches, by means of its long, flexible, and sensitive nose, for insects, leeches, small mollusks, and similar food in the mud and beneath the stones. The other species (*Myogale Pyrenaica*) inhabits the Pyrenees, is far smaller, and has a perfectly round tail, but its habits are much the same. Fossils show that the desman inhabited Europe until the last Glacial era.

DESMARETS DE SAINT-SORLIN, då'mȧ'rå' *de* săN sôr'lăN', JEAN (1595-1676). A French dramatic and historical writer. He attracted the attention of Richelieu, and through his influence became one of the founders, and the first chancellor, of the Académie Française (1634-38). Richelieu appointed him Counselor to the King and secretary-general of the Levant marine. In 1645 Desmarets became a devout Catholic. This led him to attack the Jansenists of Port Royal, and the pen war lasted three years. The most interesting of his works is *De la comparaison de la langue et de la poésie française avec la grecque et la latine* (1670), which opened the long quarrel between the ancients and the moderns.

DESMARRES, då'mär', LOUIS AUGUSTE (1810-82). A French oculist, born at Evreux. In Paris, in 1839, he established the *clinique* which he conducted for twenty-five years. He introduced the operation of iridectomy, or the cutting of the iris preparatory to forming a new pupil. He also invented an ophthalmoscope and contributed to the *Gazette des Hôpitaux*. His principal publication is a *Traité théorique et pratique des maladies des yeux* (1854-58).

DE SMET DE NAEYER, nä'yer, PAUL, COMTE (1843—). A Belgian statesman, born at Ghent. He was elected in 1886 to the chamber of deputies, where he became the leader of the conservative-clerical party. He became minister of finance in 1894 and premier in 1896, continuing to hold that office with the exception of the first six months in 1899. In 1900 he was created a count.

DES'MIDS (Neo.-Lat. *Desmidium*, from Gk. δεσμός, *desmos*, bond, tie). A very large group of fresh-water algæ, chiefly unicellular, remarkable for the symmetry of form and beauty of the cell contents. See CHLOROPHYCEÆ; ALGÆ.

DES MOINES, de moin′ (Fr., of the monks). The largest city of Iowa, State capital and county-seat of Polk County; near the geographical centre of the State, 138 miles east by north of Omaha, Neb.; on the Des Moines River, and at the mouth of Coon River (Map: Iowa, D 3). It is an important manufacturing and commercial city, and is noted for its extensive insurance interests and its exceptional railroad facilities, which include the lines of the Chicago, Rock Island and Pacific; the Chicago, Burlington and Quincy; the Chicago Great Western; the Chicago and Northwestern; the Wabash; and the Chicago, Milwaukee and Saint Paul. Des Moines was settled in 1846, incorporated as the town of Fort Des Moines in 1851, and in 1857 was chartered as a city and became the capital of the State. The city is built on gently sloping hills, and contains, among its finest structures, the Capitol, erected at a cost of $3,000,000; the United States Government Building; the State Historical Building, city library, the county courthouse and the public high school. Des Moines is the seat of Des Moines College (Baptist), established in 1865; Drake University (Christian), founded in 1881; and three other colleges, including two medical schools. It has public parks, and several bridges across the two rivers. The Iowa State Fair is held here. An army post for a regiment of cavalry has recently been established at the city. Des Moines and the surrounding region are underlaid with vast deposits of bituminous coal, a material advantage which has contributed to the rapid growth of the manufacturing industries. Among the products are books and magazines, patent medicines, brick, trunks, carriages, wagons, sleighs, engines and boilers, cotton and woolen goods, starch, pottery, oatmeal, confectionary, crackers, mattresses, harness, scales, furnaces, bicycles, plows, soap, brooms, white bronze, gloves, twine, tents, linseed oil, wall-paper, washing-machines, furniture, axle-grease, baking-powder, electrical appliances, etc. The annual income and expenditures of the city amount to about $1,485,000 and $1,483,000 respectively, the principal items in the budget being $58,000 for street lighting, $67,000 for the police department, $120,000 for the fire department, and $365,000 for schools. Population, in 1850, 502; in 1870, 12,035; in 1890, 50,093; in 1900, 62,139, including 7900 persons of foreign birth and 1700 of negro descent; in 1905 the total reached 75,136.

DES MOINES COLLEGE. An institution of higher education, situated at Des Moines, Iowa. It was established in 1865 by members of the Baptist Church, and was affiliated with Chicago University (q.v.) in 1892. The college offers the bachelor's degree in arts, science, and philosophy. It had in 1906 an enrollment of some 212, including students in the musical and preparatory departments. The library contains about 5000 volumes. Owing to large gifts recently made by friends of the institution, it entered in 1902 upon a course of rapid expansion.

DES MOINES RIVER. The most important river of Iowa. It is formed by the meeting of the east and west forks of the Des Moines in Humboldt County, Iowa. The east fork is the outlet of Okamanpadu Lake, in Emmet County, Iowa; the west fork flows from a chain of lakes among which is Lake Heron, in Jackson County, Minn. (Map: Iowa, D 3). The Des Moines flows southeasterly across Iowa, and empties into the Mississippi River (q.v.) three miles below Keokuk. It is 550 miles long, and drains an area of 14,500 square miles. From Farmington to its mouth it falls 48 feet, or 1⅗ feet per mile. The chief tributary is the Coon River, which joins it from the west at Des Moines. The chief cities along its banks are Ottumwa, Des Moines, and Fort Dodge. Through Lee County it flows in a narrow, gorge-like valley noted for its picturesque scenery.

DES′MOSPON′GLÆ. See HEXACTINELLIDA.

DESMOULINS, dȧ′mo͞o′lăɴ′, BENOIT CAMILLE (1760-94). A French politician and journalist of the time of the Revolution. He was born at Guise, in Picardy, March 2, 1760, the eldest son of the Lieutenant-General of the Bailiwick of Guise. Through the influence of a relative young Desmoulins obtained a scholarship in the Collège Louis le Grand, Paris, where he had Robespierre as a fellow-student. After his graduation young Desmoulins studied law, and became an advocate before the Parliament of Paris in 1784, but met with little success, owing, it is said, to a stammer in his speech. In 1788 he published a philosophical work, *La philosophie du peuple français*, which attracted considerable attention; but it was the dismissal of Necker, July 11, 1789, that first brought Desmoulins to the front as a Revolutionist. He heard the news on the evening of July 12, and, in the excitement of the moment forgetting his stammer, sprang on a *café* table in the garden of the Palais Royal and harangued the crowd of people around him. This scene marked the actual beginning of the Revolution. The cry "To arms!" resounded, and two days later the Bastille was taken. A republican pamphlet, *La France libre*, which he brought out, was received with instantaneous favor, and he was encouraged to follow it up with a journal of a revolutionary nature. His *Discours de la lanterne aux Parisiens* was less to his credit, and earned for him the nickname of 'Procureur de la lanterne.' Desmoulins was a hero-worshiper, but inconsistent in his allegiance, and after making Mirabeau his idol, transferred his affections to Danton, to whom he clung until the end. In 1791 both men were in danger of arrest for the extreme boldness of their views, but both escaped. It was at this time that Desmoulins ceased publishing *Les Révolutions de France et de Brabant*, his first journal, and began *La Tribune des Patriotes*, which became the organ of the Cordeliers. He was also intimate with Robespierre, who persuaded him to attack the Girondists in a work entitled *Fragment de l'histoire de la Révolution* (usually referred to as the *Histoire des Brissotins*). This venomous attack helped greatly in overthrowing the opposite party; but it is said that later Desmoulins regretted his course. With Danton he began to call for moderation, and toward the end of 1793 the first number of *Le Vieux Cordelier* appeared and stood up for just and legal trials and less severe sentences. Desmoulins attacked the Hébertists as well as the Committee of Public Safety, and the breach between the Dantonists and ultra-Jacobins grew wider. After being twice accused before the Jacobin Club, where he was defended by Robespierre, Desmoulins was at length arrested, along with Danton and others of the party. The merest formality of a trial took place, and they were all executed, April 5, 1794. Desmoulins did not face death with the unflinching courage of Danton. His beautiful young wife, Lucile Duplessis, sought in every way to rescue him, but was herself arrested and guillotined a fortnight later. Consult: *Œuvres de Camille Desmoulins, avec une notice biographique*, ed. by Matton (Paris, 1838); Claretie, *Camille Desmoulins, Lucie Desmoulins, étude sur les Dantonistes* (Paris, 1875); Eng. trans., *Camille Desmoulins and His Wife*, by Mrs. Cashel Hoey (London, 1876); Aulard, *Les orateurs de la Législative et de la Convention* (Paris, 1885-86); Lenotre, *Paris Revolutionnaire* (Paris, 1904).

DESNA, dās'nȧ. A river of Russia, rising in the Government of Smolensk, 72 miles southeast of the town of that name (Map: Russia, D 4). It flows southeast through the Government of Smolensk until it reaches Bryansk, in Orel, where it makes a sharp bend, and, after a southwestern course through the governments of Orel and Tchernigov, joins the Dnieper nearly opposite Kiev. The Desna is 690 miles in length, and is navigable for steamers as far as Bryansk. Its chief affluents are the Seim, from the left, and the Snov, from the right. The Desna has a large number of ports, and is of considerable importance in the inland trade of Russia.

DESNOIRESTERRES, dȧ'nwär'târ', GUSTAVE LE BRISOYS (1817-92). A French author, born at Bayeux. He is the author of a number of poems and novels, but his principal works have been historical studies of the eighteenth century. The most noted of these are: *Voltaire et la société française au XVIIIème siècle* (1867-76), which was crowned by the Academy; *Le cours galant* (1859-64); *La comédie satirique au XVIIIème siècle* (1884); and *Le chevalier Dorat et les poètes légers au XVIIIème siècle* (1887).

DESNOYERS, dȧ'nwä'yȧ', AUGUSTE GASPARD LOUIS BOUCHER, Baron (1779-1857). A French engraver, born in Paris. He became a member of the Institute in 1816, in 1825 was made engraver to the King, and three years later received the title of baron. He is especially known for his engravings after Raphael, whose works he interpreted with peculiar sympathy. Among the best of his plates are Raphael's "La belle jardinière" (1801); the "Madonna della Casa d'Alba" (1827); "The Sistine Madonna" (1846); and especially "The Transfiguration."

DESNOYERS, LOUIS CLAUDE JOSEPH FLORENCE (1805-68). A French author, born at Replonges (Ain). He contributed largely to the success of the *Journal des Enfants*, in which his *Mésaventures de Jean Paul Choppart* (1836) was published. This and the following story, *Aventures de Robert-Robert et de son ami Toussaint-Lavenette* (1840), are considered to be among the classics of the literature of education.

DESOLATION LAND, also called **DESOLATION ISLAND**. An island of Chile, on the south side of the west end of the Strait of Magellan. It is 70 miles long by 15 miles broad. Its westernmost point is Cape Pillar.

DESOR, de-zôr', EDOUARD (1811-82). A German-Swiss geologist, born at Friedrichsdorf, near Homburg. He studied at the universities of Giessen and Heidelberg, and in consequence of the part taken by him in political affairs was compelled to escape to Paris. Thence he went to Neuchâtel, where he became acquainted with Agassiz, whom in 1847 he accompanied to America. He subsequently became professor of geology in the Académie of Neuchâtel. He was elected a member of the Federal Grand Council, and in 1873 became its president. His publications, dealing chiefly with the geology of Switzerland, include: *Gebirgsbau der Alpen* (1865); *Les palafittes du lac de Neuchâtel* (1865); *Echinologie helvétique* (1869-72); and *Le paysage morainique* (1875).

DE SOTO. A city in Jefferson County, Mo., 43 miles south by west of Saint Louis; on the Saint Louis, Iron Mountain and Southern Railroad (Map: Missouri, F 3). It is in the centre of a lead and zinc mining region, which exports also grain, flour, produce, and live stock. Among the industrial establishments are flouring and planing mills, and railroad machine shops. Population, 1900, 5611; 1906 (local census), 7128.

DE SOTO, dȧ sō'tō, HERNANDO, or FERNANDO (c.1500-42). A Spanish adventurer and explorer in America, born at Jerez de los Caballeros, Estremadura. In 1514 he accompanied Pedrarias de Avila, his patron, to the Isthmus of Darien, and distinguished himself by his daring and independence. In 1524 he joined Córdoba in the expedition to conquer Nicaragua, but remained loyal to Pedrarias when Córdoba rebelled. Leaving the service of Pedrarias in 1528, he explored the coast of Guatemala and Yucatan, seeking for a supposed water communication between the Atlantic and the Pacific. In 1532 he was in Pizarro's expedition for the conquest of Peru, and used all his influence to prevent the murder of the Peruvian Inca. Having amassed a fortune, De Soto returned to Spain, and married the daughter of his former patron, Pedrarias. This was in 1536; soon afterwards, De Soto was appointed Governor of Cuba and Florida, by Charles V., to whom he had advanced a sum of money. Florida so far had not been thoroughly explored. On May 12, 1539, De Soto sailed from Havana with nearly six hundred men. Landing at Tampa Bay, May 25, 1539, he set out on his inland journey on July 15. For nearly three years the little army of Spaniards explored the wild country to the north and west, first penetrating as far north as the two Carolinas, then moving down the Alabama River, then north again, crossing the Mississippi at Chickasaw Bluffs, and finally returning southward to where the Red River joins the Mississippi. The Indians were everywhere brutally treated and made slaves of, the result being constant warfare. Several bloody battles were fought, the most important occurring near Mobile Bay, October, 1540, and, though the Spaniards were uniformly successful, yet over two hundred of De Soto's men perished. He himself, worn out and discouraged, succumbed to a fever on the banks of the Mississippi, May 21, 1542. His body was secretly sunk in the river, lest the hostile Indians should get at it, and the shattered remnants of the expedition, after many further privations, succeeded in floating down the Mississippi to the Gulf of Mexico and reaching their countrymen at Pánuco. An interesting contemporary account of De Soto's expedition is the *Narrative of the Career of Hernando de Soto in the Discovery of Florida by a Knight of Elva*, etc., ed. by Bourne (New York, 1904). The following secondary authorities deal with it fully: Winsor, *Narrative and Critical History of America* (8 vols., Boston, 1884-89); Bancroft, *History of the United States* (6 vols., New York, 1883-85); Shipp, *History of H. de Soto* (Philadelphia, 1881); Grace King, *De Soto . . . in the Land of Florida* (1888).

DESPAIR, Giant. The monstrous owner of 'Doubting Castle,' where Christian and Hopeful are temporarily imprisoned, in Bunyan's *Pilgrim's Progress*.

DESPARD, dĕs′pärd, Edward Marcus (1751-1803). An Irish conspirator, born in Queen's County. He entered the army as ensign, and in 1779 was appointed engineer in the San Juan expedition, in which he distinguished himself. In 1781 he became commander of the island of Pattan, with the rank of captain, and subsequently of the Bay of Honduras and the entire Mosquito Coast. Soon after the peninsula of Yucatan had been added to his domains, by Spanish grant, he was accused of cruelty and other offenses by the prior English settlers, who resented the concessions made to logwood-cutters from the Mosquito Coast. He was ordered to England, where he remained from 1790 to 1792, only to learn that no real accusation had been preferred against him. An unjustifiable imprisonment from 1798 to 1800 so incensed him against the Government that he devised a plot, which included in its details the assassination of the King and the capture of the Bank of England and the Tower. He was convicted of treason, and executed at Newington.

DESPEN′SER. A powerful English family of the thirteenth and fourteenth centuries. Hugh le Despenser (died 1265) was justiciar of England for some time between 1260 and 1265, and was associated with Simon de Montfort in the rising against Henry III. He was killed at the battle of Evesham. His son, Hugh le Despenser the Elder (1263-1326) played a very prominent part in the reign of Edward II. He served in the Welsh wars and in Scotland, being present at the battle of Dunbar in 1296. Subsequently he was employed on numerous diplomatic missions to various European powers and to the Pope. Up to the year 1308 he was a member of the Barons' party, in which his property and rank assured him a high position, but about the time of the fall of Gaveston (q.v.), the King's favorite, he abandoned the cause of the Barons, and became the head of the Court party, and a bitter enemy of Thomas, Earl of Lancaster. Though undoubtedly avaricious and unscrupulous in the means he adopted for increasing his possessions, Hugh was probably no more selfish than most of the great nobles of his time, who took advantage of the presence of a weak king on the throne to further their own interests. In 1321 the Barons' party gained the upper hand, and Hugh was sentenced by Parliament to banishment. He was recalled, however, in the following year, when the King's faction was once more in the ascendent, and contributed no doubt to the fall and death of the Earl of Lancaster. In the same year he was made Earl of Winchester, and his position became more influential than ever. The feeling of hatred with which he was regarded by all the great nobles finally led to the outbreak of a rebellion, in which Isabella, the wife of Edward II., joined. The Queen's forces marched upon Bristol, which was defended by Hugh le Despenser. The King's favorite was forced to surrender, and was speedily beheaded. Hugh le Despenser the Younger (died 1326) was the son of the preceding. In his youth he was the intimate friend of the young Prince of Wales, afterwards Edward III., and served with him in the Scottish wars. He obtained great wealth by his marriage to one of the heiresses of the house of Gloucester, and, like his father, was for a time a prominent leader among the Barons, with whom he made common cause for a long time after his father had gone over to the Court party. It was not until 1318 that he went over to the King, being actuated in this move by an insatiable greed for land, which had brought him into repeated conflicts with many of the nobles of the Marches. A league was formed against him, headed by the Earl of Lancaster, and in 1321 he was banished with his father. With his father, he was recalled in the following year, restored to his old possessions, and overwhelmed with grants and new titles. He met the same fate as the elder Hugh. In the Barons' rising of 1326 he was taken prisoner, brought to Hereford, tried upon the charge of piracy and complicity in the death of Thomas of Lancaster, and put to death. A grandson of Hugh the younger was the 'warlike bishop,' Henry of Norwich, who died in 1406. He was chosen by Urban VI. to lead a crusade against the followers of Clement VII. in Flanders. A great-grandson, Thomas (1337-1400), was created Earl of Gloucester.

DESPÉRIERS, dȧ′pȧ′ryȧ′, Bonaventure (1500-44). A French satirist and story-teller, born at Arnay-le-Duc. He was a courtier of Margaret of Angoulême, and, either through insanity or fear of persecution which she was powerless to avert, committed suicide. Besides translations and poems of minor interest, he left a collection of 129 *Nouvelles récréations et joyeux deviz* (1558), gross sometimes in substance, but always masterly in style, and ranking high among similar collections. More important is the satiric dialogue *Cymbalum Mundi* (1537), suggesting Lucian in its mockery of superstition, old and new, with an occasional pensive seriousness very characteristic of the finer culture of the French Renaissance. Despériers's *Works* are best edited by Lacour (Paris, 1866). Consult Chenevière, *Bonaventure Des Périers* (Paris, 1886).

DES PLAINES (dȧ-plăn′) **RIVER** (Fr., of the plains). A river rising near Racine, Wis. (Map: Illinois, D 2). It flows south nearly parallel with the shore of Lake Michigan, and from six to twelve miles distant, to Lyons, just west of Chicago, Ill.; thence southwest, uniting with the Kankakee River (q.v.) in Grundy County, Ill., and forming the Illinois River (q.v.). It is separated from the lake by a low divide, over which, during high water, it discharges into the Chicago River (q.v.). For thirteen miles, its waters have been deflected to form the Chicago Drainage Canal (q.v.). It is 150 miles long, and drains an area of 1700 square miles.

DESPORTES, dâ'pôrt', François Alexandre (1661-1743). A French painter, born at Champigneul. He was the pupil of Nicasius and Snyders, and the latter master always influenced his choice of subjects, which usually dealt with the chase and still life. After a stay of two years in Poland, he returned to France, and in 1699 became a member of the Academy. He designed eight compositions for the Gobelin tapestries, and decorated several of the French châteaux and palaces. In 1712 he went to England in the suite of the French ambassador, and was received with enthusiasm at the Court. There are nearly thirty pictures by him in the Louvre.

DESPORTES, Philippe (1546-1606). A French poet, born at Chartres. In his youth he went to Italy as secretary to the Bishop of Puy, and there studied the Italian poets, especially Petrarch and Ariosto, whom he imitated in his sonnets and elegies. On his return he rose rapidly in favor, and enjoyed during his lifetime the reputation of a Ronsard. He was essentially a courtier; he praised the loves of the last Valois, and became Abbé and Canon of Notre Dame, and Court poet. His talent, neither original nor profound, is best shown in such charming verses as *Contre une nuit trop claire* and *Rosette pour un peu d'absence*, although certain of his religious poems have a sober beauty. Editions of his works appeared in 1573, 1583, and 1592. They were also published with an introduction by Michiels, as *Œuvres de Philippe Desportes* (1858).

DESPOT (from Gk. *δεσπότης, despotês*, master, lord, ruler). An absolute ruler who carries on the government entirely in his own interests, pursuing generally a policy of cruelty and oppression. Like 'tyrant,' the word 'despot' originally carried no odious meaning, and denoted merely the possessor of unlimited power. In a modified sense, but still free from the imputations of tyranny, the title was applied to the rulers of the Greek towns of Asia Minor under the Persian domination, and subsequently to the governors of the Asiatic provinces and towns of the Byzantine Empire.

DESPRÈS, Josquin. See Deprès, Josquin.

DESPRETZ, dâ'prâ', César Mansuète (1792-1863). A French physicist, born at Lessines, Belgium. He was instructor of physical sciences at the Collège Henri IV. in Paris, and at the Polytechnic Institute, and was appointed professor at the Sorbonne about 1837. His writings were published in the *Comptes Rendus* of the Paris Academy of Sciences, of which society he was a member; and in the *Annales de Chimie et de Physique* (1817-56). His *Traité élémentaire de physique* (4th ed., 1896) was adopted by the Council of Public Instruction. A product of carbon introduced by him is said to be almost as serviceable as diamond-dust for polishing purposes.

DESSAIX, dâ'sâ', Joseph Marie, Count (1764-1834). A French general and politician, born at Thonons, in Savoy. In 1791-92 he raised volunteers for France in Savoy, and was present at the siege of Toulon, and subsequently served under Napoleon in Italy. He was a member of the Council of Five Hundred, and was one of the few who opposed the coup d'état of the Eighteenth Brumaire. Nevertheless, he was made a brigadier-general in 1803, and rose to be general of division by 1809. His conduct at Wagram won him the title of 'the Intrepid' from the lips of the Emperor. He was created a count in 1810, and made Governor of Amsterdam. In the Russian campaign of 1812 Dessaix was severely wounded at Borodino. In 1814 he was successful against the Allies in Savoy. After the Revolution of 1830 he was appointed commander of the National Guards at Lyons. He died October 26, 1834. For the details of his life, consult Dessaix et Folliet, *Etude historique sur la révolution et l'empire en Savoie. Le général Dessaix—sa vie politique et militaire* (Paris, 1879).

DESSALINES, dâ'sâ'lēn', Jean Jacques (1758-1806). A negro military leader, known as Jean Jacques I., Emperor of Haiti. He was born in Guinea, Africa (according to some accounts at Grand Rivière, Haiti), and was sold as a slave, at Cap Français (now called Cape Haitien). In 1791 he entered the insurgent ranks under Biasson, and subsequently, with rank of lieutenant-general, became one of the trusty subordinates of Toussaint l'Ouverture. For some time he maintained a guerrilla warfare against General Leclerc, the officer sent by Napoleon to subjugate the island, but, upon the conclusion of peace, in 1802, he professed allegiance to the French, and was appointed governor of the southern division of Haiti, with rank of a general of division. Angered at the severe repressive measures of General Rochambeau, who succeeded General Leclerc, he organized and directed an uncompromising revolt, which, with the assistance of an English squadron, ended in the utter expulsion of the French. In 1804 he was appointed Governor-General for life. But, infuriated by the failure of his expedition against the Spanish part of the island, he had himself crowned Emperor, and proceeded to a cruel despotism. He was assassinated by two of his officers, Pétion and Christophe, the latter of whom became President of Haiti. Consult Dubroca, *Vie de J. J. Dessalines* (Paris, 1804).

DESSAU, dĕs'sou (first called *Dissouwe*, then *Desso*). The capital of the German Duchy of Anhalt, and residence of the Duke, on the Mulde, not far from its junction with the Elbe, about seventy miles by rail southwest of Berlin (Map: Germany, E 3). The town lies in a well-wooded plain, surrounded by a very fertile and richly cultivated country. The streets are broad and well shaded. The ducal palace, dating in part from the sixteenth century, contains a collection of paintings, including some excellent examples of the early Italian and Flemish schools. The palace is interesting also for its fine architectural features, its suite of Old German rooms, and its relics of Prince Leopold (known as 'the old Dessauer') and Napoleon. Among the other buildings of note may be mentioned the old and new town halls, the palaces of Princess Louise and the hereditary prince, the Parliament building, and the new post-office and the theatre. The Church of Saint Mary contains several pictures by the two Cranachs, and in the vaults the tomb of Prince Leopold, the sarcophagus being surrounded by the figures of six grenadiers. The town's affairs are administered by a municipal council of thirty, and an executive board of three members. The town is lighted by gas and electricity, has an excellent water-supply, and has established a modern sewerage system. An electric street railway provides for local traffic. The town has considerable manufactures, chief among them being sugar-refining, iron-casting and machine-building, spinning and weaving of cloth, and carpet-making. It is also a river port, and carries on a lively trade, particularly in grain. Its educational establishments are numerous and excellent, and include a gymnasium, several technical schools, and three large libraries, one of which is maintained by the town. Its charitable institutions are equally numerous, chief among them being the Amalien Stiftung, established by the daughter of Prince Leopold, and containing an interesting collection of paintings by German and Flemish masters of the eighteenth century. Dessau is the birthplace of the poet Wilhelm Müller, and of the philosopher Moses Mendelssohn, both being commemorated by monuments. The bridge over the Elbe was the scene of the brilliant victory won during the Thirty Years' War by Wallenstein over Count Mansfeld, on April 25, 1626. Population, in 1890, 34,658; in 1900, 50,846; in 1905, 55,134. Dessau was founded in the Twelfth Century by Albert the Bear, received civic rights in 1213, and upon the division of Anhalt in 1603 became the residence of the Anhalt-Dessau line. It suffered severely during the Thirty Years' War, but began to recover its prosperity in the Eighteenth Century.

DESSOIR, dâ'swär', LUDWIG (properly LEOPOLD DESSAUER) (1810-74). A German actor, born in Posen. He was attached to the Leipzig Theatre from 1834 to 1837, that of Karlsruhe from 1839 to 1844, and the Hof Theater of Berlin from 1847 until his retirement in 1872. As an interpreter of tragic rôles from Goethe, Schiller, and Shakespeare, he took high rank.

DE STAEL, de stäl. See STAEL-HOLSTEIN.

DESTERRO, dâ-stâr'rô, **NOSSA SENHORA DO DESTERRO**, nôs'sȧ sȧ-nyō'rȧ dô dâ-stâr'rô, or SANTA CATHARINA, also called Florianopolis. The capital of the State of Santa Catharina, Brazil, situated on the west coast of the island of the same name (Map: Brazil, H 9). It has a picturesque site, being surrounded by hills, is regularly built, and contains a fine plaza, around which centre the principal buildings and a lyceum, an arsenal, and a hospital. An excellent harbor defended by fortifications has contributed to the city's commercial development, its principal exports being manioc flour, rice, coffee, sugar, fish, earthenware, and artificial flowers. Population, in 1890, 30,687. Desterro was founded in 1640 by colonists from the Azores.

DESTOUCHES, dâ'tōōsh', PHILIPPE NÉRICAULT (1680-1754). A French dramatist, born at Tours, August 22, 1680. Of his seventeen comedies, *Le dissipateur* (1736) and *Le glorieux* (1732) are pronounced by Lessing "models of finer high comedy"; and the largely autobiographic *Le philosophe marié* (1727) is also a classic of the French stage. Others would please more if they strove less to edify. Except in *La fausse Agnès* (1736), Destouches took his comic vocation too seriously, but he is important as a witness to the change in public feeling that was to welcome the 'tearful comedy' (*comédie larmoyante*) of La Chaussée.

DESTROYING ANGELS or DANITES. See DANITES.

DESTRUCTOR, REFUSE. See GARBAGE.

DESTUTT DE TRACY, dâ'stụt' de trȧ'sē', ANTOINE LOUIS CLAUDE, Count (1754-1836). A French philosopher. At the outbreak of the Revolution he was a colonel in the army and was sent to the States-General as a delegate of the nobility of Bourbonnais. In 1792 he accompanied his friend Lafayette into exile, but returned secretly to France not long afterwards and was cast into prison, from which only the downfall of Robespierre released him. Under Napoleon he was a Senator, and after the Restoration was created a peer by Louis XVIII. As a philosopher he represented the doctrine of sensualism, following more especially Condillac, whose system he further developed to the so-called ideologism. His principal work is *Eléments d'idéologie*. Besides this, the *Commentaire sur l'esprit des lois de Montesquieu*, deserves especial mention. It was first published in English in 1811, in Philadelphia.

DE TAB'LEY, LORD. See WARREN, JOHN BYRNE LEICESTER.

DETACHMENT (Fr. *détachement*, from *détacher*, to detach, from *de*, away + *-tacher*, to fasten, from It. *tacca*, tack, from Bret. *tach*, Ir. *taca*, Gael. *tacaid*, nail), MILITARY. A body of troops detached from the main body, generally a small body detached for special duties away from the regiment, brigade, division, or army to which they belong, as the case may be.

DETAILLE, de-tâ'y', JEAN BAPTISTE EDOUARD (1848—). A French military painter. He was born in Paris, October 5, 1848. A pupil of Meissonier, his paintings evince the same devotion to detail and to fine, almost microscopic finish, that marks the works of his distinguished master. His "Repose During Drill in Camp Saint Maur" (1869), painted when he was twenty-one years old, secured him his first medal. In 1870 he took up arms for his country, but he was never unmindful of his art, and made sketches whenever he could. It was in sketching scenes incident to camp life that he perfected his technique, and made himself competent to reproduce vividly and correctly the movements of troops in preparation for battle, or resting after a fight. The horrors of war he suggests rather than depicts, and his treatment may be observed in his "Salute to the Wounded" (1877). His "Movement of Troops" is a well-known canvas. His "Passing Regiment" (1875), which is familiar by its reproductions, is the property of the Corcoran Gallery in Washington. The Metropolitan Museum of Art, New York, possesses three of his works, including the "Defense of Campigny," called by the artist his best work, and the Vanderbilt collection has a like number. He was made a chevalier of the Legion of Honor for his "Retreat." Consult: Claretie, *L'art et les artistes Français contemporains*, II. series (Paris, 1876); Goetschy, *Les jeunes peintres militaires* (Paris, 1878).

DETAINER (from Lat. *detinere*, from *de*, off + *tenere*, to hold). The technical term of the common law for a withholding of the possession of property. The gist of the act is not the manner in which the adverse possession was acquired —this may have been lawful or unlawful—but the continued detention of the property from one who claims the right to the possession thereof. No question of title or ownership is necessarily involved in the notion of a detainer, as one who is not the owner may nevertheless be entitled to the possession of the property, and, on the other hand, the owner may be guilty of an unlawful detainer of his own land or goods. A detainer is always an act of force, and may be lawful or unlawful. The appropriate remedy where goods are unlawfully detained is *detinue*, or *replevin*, and if, after demand made, the holder refuses to return them, he is deemed to have converted them to his own use, and becomes liable to an action in trover for damages. An unlawful detainer of lands gives rise to a right of entry, or, in modern practice, to an action of ejectment. Trespass is not available if the original entry was rightful, nor can any action be employed whose purpose is to try the question of title, as that is not involved. When a detainer follows upon a wrongful entry, it may, nevertheless, be valid, as when one, in violation of law, forcibly recovers possession of his land from an intruder. Here the illegal entry is punishable, but in some jurisdictions the subsequent possession of the owner of the land will not be disturbed. See CONVERSION; DETINUE; FORCIBLE ENTRY.

D'ÉTAMPES, dā'tänp′, DUCHESSE. See ESTAMPES, ANNE DE PESSILEU, DUCHESSE D'.

DETECTIVE (from Lat. *detectus*, from *detegere*, expose, from *de-* neg. + *tegere*, to cover). One who engages in the work of securing information about wrongdoers for the purpose of having it used against them in civil or criminal proceedings. He may be a public officer or a private employee. In many cities there are extensive detective bureaus, whose members are in no way connected with the official police or constabulary establishments. Some States forbid persons to act as detectives without a license from a court or other official source. A detective does not become an accomplice of a criminal even when his knowledge of the criminal's plans would have enabled him to prevent the commission of the crime. His act in entrapping a criminal, if limited to mere entrapment, does not render him liable to punishment, nor does it in any way excuse or exonerate the criminal.

DETERMINANTS (Lat. *determinans*, pres. part. of *determinare*, from *de-* + *terminare*, to bound, limit). Certain algebraic functions remarkable for their brevity of notation and their wealth of significant properties. $\begin{vmatrix} a_1 & b_1 \\ a_2 & b_2 \end{vmatrix}$, $\Sigma \pm a_1b_2$, or (a_1b_2) are merely other notations for $a_1b_2 - a_2b_1$. The first form is commonly used in elementary mathematics. Similarly

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$$

represents $a_1b_2c_3 + a_2b_3c_1 + a_3b_1c_2 - a_3b_2c_1 - a_2b_1c_3 - a_1b_3c_2$. Such functions are called determinants, and the quantities a_1, b_1, c_1, a_2, b_2, . . . are called elements. The first or square form of notation is called the array notation. If there are more columns than rows the form is called a *matrix*. An array of two columns and two rows is called a determinant of the second order, one of three columns and three rows a determinant of the third order, and so on. In the expansion of a determinant of the second order there are two terms, each containing the letters a, b, but differing in the arrangement of the subscripts, 1, 2. In the expansion of a determinant of the third order there are six terms, each containing the letters a, b, c, but differing in the arrangement of the subscripts 1, 2, 3. Thus there are two terms in the expansion of a determinant of the second order, and six in one of the third order, half of which are positive and half negative. The signs are selected according to the arrangement of the subscripts. If there is an even number of inversions in the order of the subscripts of any term, its sign is considered plus; if an odd number, its sign is considered minus; e.g. in the term $a_3b_2c_1$, 3 standing before 2 is an inversion, since the natural order is 2 before 3; likewise, 3 before 1 and 2 before 1 are inversions; there being three inversions, the sign is minus. A determinant of the fourth order contains 16 elements, and its expansion contains 24 terms. In general, a determinant of the nth order contains n^2 elements, and its expansion $n(n-1)(n-2) \ldots 2 \cdot 1$, or $n!$ terms. Some of the leading properties of determinants are: (1) If two adjacent columns or rows of a determinant are interchanged, the sign only of the determinant is changed; if a column or row is transposed over an odd number of columns or rows, the sign only of the determinant is changed; if a column or row is transposed over an even number of columns or rows, the determinant is unchanged. (2) If the columns be made rows, and conversely, the determinant is unchanged. (3) If the elements of a row or column be added to the corresponding elements of another column or row, the value of the determinant is unchanged. (4) Multiplying the elements of any column or row by a number multiplies the determinant by that number. (5) If two columns or two rows are identical, or if the elements of any row or column are all zeros, the determinant vanishes. Such properties are of great aid in evaluating determinants.

Various methods of expansion have been devised, by which the terms, each containing one element and only one, from each column and each row, can readily and systematically be formed. While these methods can best be obtained from a text-book on the subject, minor determinants will be explained here, since they furnish a simple means for expanding determinants of degrees higher than the third. If the column and row to which any element belongs are suppressed, the resulting determinant is called a first minor of the given determinant, or the co-factor of the given element. If two rows and two columns be suppressed, the resulting determinant is called a second minor of the given determinant, and so on. Thus, in

$$\Delta = \begin{vmatrix} a_1 & b_1 & c_1 & d_1 \\ a_2 & b_2 & c_2 & d_2 \\ a_3 & b_3 & c_3 & d_3 \\ a_4 & b_4 & c_4 & d_4 \end{vmatrix}$$

$(b_2c_3d_4)$ is a first minor of Δ and a co-factor of the leading element a_1, and (a_1b_2) is a second minor of Δ.

If the co-factors of a_1, b_1, c_1, d_1 be denoted by A_1, B_1, C_1, D_1, then it can be shown that $\Delta = a_1A_1 + b_1B_1 + c_1C_1 + d_1D_1$. It should be observed that A_1, B_1, . . . involve their own signs, and that in the above equation B_1 and D_1 are negative. Thus a determinant of the nth order may be expanded in terms of determinants of the $(n-1)$th order, and so on. Determinants also admit, in their abridged form of notation, of the fundamental operations of addition, subtraction, and multiplication (including involution).

These functions are of great importance in the solution of simultaneous equations. The roots in the case of two linear equations, $a_1x + b_1y = c_1$ and $a_2x + b_2y = c_2$, are expressed thus: $x = \frac{(c_1b_2)}{(a_1b_2)}$, $y = \frac{(a_1c_2)}{(a_1b_2)}$. In the case of three equations involving three unknowns, of the type $a_1x + b_1y + c_1z = d_1$, $a_2x + b_2y + c_2z = d_2$, $d_3x + b_3y + c_3z = d_3$, the roots are

$$x = \left(\frac{d_1b_2c_3}{a_1b_2c_3}\right), y = \left(\frac{a_1d_2c_3}{a_1b_2c_3}\right), z = \frac{(a_1b_2d_3)}{(a_1b_2c_3)}$$

In the case of n linear equations involving n unknowns,

$$x = \frac{(l_1 b_2c_3 \ . \ . \ . \ k_{\mathrm{n}})}{(a_1b_2c_3 \ . \ . \ . \ k_{\mathrm{n}})},$$

For n homogeneous linear equations, the determinant notation serves to express the necessary and sufficient condition for the consistency of the system. Thus, in the system $a_1x + b_1y + c_1z = 0$, $a_2x + b_2y + c_2z = 0$, and $a_3x + b_3y + c_3z = 0$, if $(a_1b_2c_3) = 0$, the equations can be satisfied by a set of values of x, y, z. This determinant of the coefficients is called the *discriminant* or the *eliminant* of the system of equations. It is the expression which results from eliminating the unknowns from the given equations. The discriminants of higher equations also may be expressed in determinant form. Thus the eliminant of two equations, one of the mth and the other of the nth degree, may be found by a method known as Sylvester's *dialytic process;* e.g. to form the eliminant of $px^2 + qx + r = 0$ and $ax^3 + bx^2 + cx + d = 0$, multiply the members of the first equation by x and by x^2, and the second by x, and form a system of five equations considering x^4, x^3, x^2, and x as the unknowns. The eliminant is

$$\begin{vmatrix} 0 & 0 & p & q & r \\ 0 & a & b & c & d \\ a & b & c & d & 0 \\ 0 & p & q & r & 0 \\ p & q & r & 0 & 0 \end{vmatrix} = 0.$$

If u, v, w are functions of x, y, z, the determinant

$$\left(\frac{du}{dx}, \frac{dv}{dy}, \frac{dw}{dz}\right) \equiv \frac{d(u, v, w)}{d(x, y, z)} \equiv \mathrm{J}(uvw)$$

is called the Jacobian of the system u, v, w, with respect to x, y, z. In the particular case where u, v, w are the partial differential coefficients (see CALCULUS) of the same function of the variables x, y, z, it is called the Hessian of the primitive function. These and other expressions play an important part in expressing the properties of certain curves (q.v.) and surfaces; e.g. it is shown in modern geometry that if the first polar of any point A, with respect to a curve $u = 0$, homogeneous in x, y, z, has a double point B, the polar conic of B has a double point A. The locus of the double point B is expressed by the Hessian

$$\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$$

which is satisfied by x, y, z, and in which a, b, c . . . are differential coefficients of the second order. This function is also an example of a covariant. See FORMS.

The idea of determinants may be said to take its origin with Leibnitz (1693), following whom Cramer (1750) added somewhat to the theory, treating the subjects wholly in relation to sets of equations. The recurrent law was first announced by Bézout (1764). But it was Vandermonde (1771) who first recognized determinants as independent functions, giving a connected exposition of the theory, and hence he deserves to be called its formal founder. Laplace (1772) gave the general method of expanding a determinant in terms of its complementary minors. Immediately following, Lagrange (1773) treated determinants of the second and third orders, being the first to apply these functions to questions foreign to eliminations, and he discovered many special properties. Gauss (1801) introduced the name determinants, although not in its present sense; he also arrived at the notion of reciprocal determinants, and came very near the multiplication theorem afterwards given by Binet (1811-12) and Cauchy. With the latter (1812) the theory of determinants begins in its generality. The next great contributor, and the greatest save Cauchy, was Jacobi (from 1827). With him the word determinant received its final acceptance. He early used the functional determinant, which Sylvester has called the Jacobian, and in his famous memoirs, in Crelle for 1841, he specially treats this subject, as well as that class of alternating functions known as alternants. But about the time of Jacobi's closing memoirs, Sylvester (1839) and Cayley (qq.v.) began their great work, a work which it is impossible to summarize briefly, but which represents the development of the subject to the present time. The study of special forms of determinants has been the natural result of the completion of the general theory. Axi-symmetric determinants have been studied by Lebesgue, Hesse, and Sylvester; per-symmetric determinants by Hankel; circulants by Catalan, Spottiswoode, Glaisher, and Scott; skew determinants and Pfaffians, in connection with the theory of orthogonal transformation, by Cayley; continuants by Sylvester; Wronskians by Christoffel and Frobenius; Jacobians and Hessians by Sylvester; and symmetric gauche determinants by Trudi. The theory as a whole has been most systematically treated by F. Brioschi (1824-1897), well known as the editor of the *Annali di Matematica*, whose masterly treatise on determinants is a standard. (French and German translations, 1856. See also his *Opere matematiche*, Milan, 1901—.) Consult: Muir, *Theory of Determinants in the Historical Order of Its Development*, part i. (London, 1890); Baltzer, *Theorie und Anwendungen der Determinanten* (Leipzig, 1881); Doster, *Eléments de la théorie des déterminants* (Paris, 1877); Scott, *Theory of Determinants* (Cambridge, 1880); Salmon, *Lessons Introductory to the Modern Higher Algebra* (Dublin, 1876); Merriman and Woodward, *Higher Mathematics* (New York, 1898).

DETERMINATE PROBLEM. In algebra or geometry, a problem of a limited number of solutions; e.g. given the base, perimeter, and area of a triangle to construct it. In this problem there are, in general, four solutions. But if any one of the three elements is omitted, the problem becomes indeterminate. The equation $2x + 3y = 12$ can be satisfied by an indefinite number of values of x and y; hence it is indeterminate, but the equation $3x^2 - 12 = 0$ has only two roots, 2, —2; hence it is determinate. See DIOPHANTINE ANALYSIS.

DETERMINISM. The name given to the view that every event in time, psychic as well as physical, has a cause (see CAUSALITY), and that the cause being given, the event follows unvaryingly. It is opposed to indifferentism or indeterminism, which maintains that, at least in the phenomenon of the human will, the temporal antecedents do not definitively determine the event. These opposing doctrines have interest only in the sphere of ethics, as determinism is universally admitted to be true of all events except volition. The frankest of indeterminists, Prof. W. James, admits that his doctrine is an advocacy of chance, pure and simple. Others seek to avoid this confession, but with no success. The determination of will by motives could not be questioned were it not thought to carry with it a denial of moral responsibility. But so far is this from being the case that indeterminism on the contrary makes responsibility absurd. See ETHICS; CHANCE; FREE WILL; WILL; and consult the authorities referred to under ETHICS; also James, *The Will to Believe* (Boston, 1897); Fouillée, *La liberté et le déterminisme* (2d ed., Paris, 1883).

DET'INUE (OF. *detinu*, from Lat. *detinere*, from *de*, back, + *tenere*, to hold). A personal common-law action for the recovery of specific goods and chattels, wrongfully detained from the claimant, together with damages for their detention and costs of the action. The chattels must be such as can be distinguished from others; the action would not lie where claimant's property, as wheat, was lawfully mixed with other wheat so that it could not be separated. The action is not based on contract, express or implied, but is for the redress of a wrong. The value of the chattel is always alleged in the declaration, and if the chattels have been destroyed, or cannot be returned for any reason, the plaintiff may recover their value. It is immaterial whether the defendant came into possession of the chattels lawfully or wrongfully. It is sufficient if he has no present right to retain them as against the claimant. Thus, if the defendant held goods as a gratuitous bailee, his possession would be lawful until a demand was made by the proper party for their return; but in case of refusal to do so, the claimant might maintain detinue, as the detention would then be unlawful. Demand before suit is not necessary if the original taking was wrongful. Possession of the chattels cannot be obtained until final judgment, and in this respect it is not so desirable as replevin (q.v.), where the plaintiff gets immediate possession. The plaintiff must have a general or special property or interest in the chattels and a right to immediate possession in order to maintain the action. A judgment for the plaintiff was formerly enforced by a special form of execution, called a writ of *distringas* (q.v.). This form of action has been abolished in England, but is retained in several of the United States. See COMMON FORMS; COMMON LAW; PLEADING; REPLEVIN; TROVER.

DETMOLD, dĕt'mōlt (OHG. *Theotmalli*, *Thiatmalli*, people's court). The capital of the German Principality of Lippe and residence of the Prince, situated on the Werre, at the edge of the Teutoburg Forest, about 47 miles southwest of Hanover (Map: Germany, C 3). It consists of an old and a new town, the latter of which is well built, and adorned with many fine public walks and gardens. The chief buildings are the old and new palaces, the Rathaus, and theatre. Its educational institutions include a gymnasium, a manual training school, a deaf and dumb school, and a library of some 100,000 volumes. The industries, which are comparatively unimportant, include the manufacture of buttons, labels, tobacco, furniture, and several breweries. Population, in 1890, 9733; in 1900, 11,971; in 1905, 13,157. The sturdy "Senner" race of horses is bred near Detmold. The Externsteine, a much-visited group of rocks, with a grotto and a quaint religious relief, are in the vicinity. About two miles to the southwest of the town, on the Grotenburg, one of the highest points of the Teutoburg Forest, stands the colossal Hermanns-Denkmal, or Arminius Monument, erected in honor of the famous Cheruscan Prince who gained in the neighborhood such a signal victory over the Roman general Varus. Detmold was the scene of a victory won by Charlemagne over the Saxons in 783. In 1011 it was presented by King Henry II. to the bishops of Paderborn, and from them it came to the Lippe family. It received civic rights in 1350.

DETRI'TUS (Lat., a rubbing away, from *deterere*, to rub away, from *de*, down + *terere*, to rub). A general geological term applied to fragmental accumulations formed by the disintegration of rocks. See EROSION.

DE TROBRIAND, de trō'brē'äN', PHILIPPE REGIS (1816-97). A Franco-American soldier and writer. He was born near Tours, France; was educated in Paris, Rouen, Tours, and Poictiers, and in 1841 emigrated to the United States. He edited and published the *Revue du Nouveau Monde* in New York from 1849 to 1850, and from 1854 to 1861 was joint editor of the *Courrier des Etats-Unis*. He entered the Federal army as colonel of the Fifty-fifth New York Volunteers in 1861; took a conspicuous part in the battles of Fredericksburg, Chancellorsville, and Gettysburg; became a brigadier-general of volunteers in January, 1864; and commanded a division in Grant's campaign against Lee. He was brevetted major-general of volunteers in April, 1865; was appointed colonel of the Thirty-first Infantry in the regular army in 1866; was brevetted brigadier-general of the United States Army in 1867, and afterwards commanded the districts of Dakota, Montana, and Green River. In 1879 he retired from active service. He published *Les gentilshommes de l'ouest* (1841), and *Quatre ans de campagnes à l'armée du Potomac* (1867).

DETROIT. The chief city of Michigan, a port of entry, and the county-seat of Wayne County; on the Detroit River, 18 miles from Lake Erie, and seven miles from Lake St. Clair. It is in latitude 42° 19′ N. and longitude 82° 58′ W.; 85 miles east-southeast of Lansing, 285 miles east by north of Chicago, and 251 west by south of Buffalo (Map: Michigan, K 6). The altitude of Detroit is about 600 feet; mean annual temperature, 48.4° F.—January, 24.6°; July, 72°; average annual rainfall, 36.19 inches.

The river, sometimes called "The Dardanelles of the New World," which is here the boundary between the United States and Canada, is half a mile wide and thirty to fifty feet deep. It affords a splendid harbor, with a water-front of about nine miles. Fort Wayne, with its extensive works, commands the channel. Ferries connect with the Canadian side. The river contains many beautiful islands, which, with those on Lake Saint Clair, are popular as places of summer residence and as resorts. Grosse Isle is the largest of these river islands, and Belle Isle has been converted into the city's finest park.

The city has an area of 36 square miles, and is finely situated on ground rising gradually from the river. It has a reputation for broad, clean, well shaded and paved streets. Of a total of about 650 miles of thoroughfares, more than one-half is paved, the principal streets being laid with brick or asphalt. Most of the streets cross at right angles, but these are intersected by several broad avenues, radiating from the Grand Circus, a semicircular park of five and a half acres in the heart of the city. Woodward Avenue extends through this, and divides the city into nearly equal portions. This intersection of streets and avenues has resulted in a number of small triangular parks, some of which contain handsome fountains. Woodward Avenue, the principal business street, and at its northern end the centre of a fine residence district, is the location of many of the city's most prominent buildings. The Campus Martius, a considerable plot of ground about a half-mile from the river, is a part of Woodward Avenue. Jefferson Avenue, in part also an important business centre, and West Fort Street, contain costly dwellings. Michigan, Gratiot, and Lafayette avenues have many notable buildings; the banking houses of Griswold Street compare favorably with those of Wall Street, New York City. Grand Boulevard, 150 to 200 feet wide and paved with macadam, has its head at Jefferson Avenue, and its terminus on the opposite side of the city. It surrounds the heart of the city, being about twelve miles long, and is a magnificent thoroughfare.

The street railway system of Detroit operates 533 miles of track, including the interurban systems to Mt. Clement, Port Huron, Flint, Pontiac, and Trenton. The company has also acquired a traction line running from Detroit to Toledo.

Buildings. The Wayne County court-house is the largest and one of the most attractive of the public edifices. The City Hall, facing the Campus Martius, is 200 feet long by nearly 100 feet wide, built of sandstone, at a cost of $600,000. On the Campus is the Soldiers' and Sailors' Monument, by Randolph Rogers, 55 feet high, and surmounted by a representation of "Michigan." The Majestic and Penobscot buildings, near the City Hall, are Detroit's finest office-buildings. The Post-Office, Masonic Temple, Federal Building, Chamber of Commerce, Detroit Athletic Club house, Y. M. C. A. Building, Harper and Grace hospitals, and the Hotel Pontchartrain are notable. Among the finest ecclesiastical structures are Saint Anne's (Roman Catholic), First Unitarian, First Congregational, First Presbyterian, Fort Street Presbyterian, Trinity (Protestant Episcopal), Sacred Heart of Mary (Roman Catholic), Woodward Avenue Baptist, Saint John's (Protestant Episcopal), and Christ Episcopal churches, and Temple Beth El. The Museum of Art has a library, and collections on art, archæology, science, local and general history, valued at $400,000. Its special features are the Stearns collection of Oriental curios, one of the finest in America, and the Scripps collection of old masters, which includes valuable specimens of famous artists.

Parks. The most notable feature of the public park system, which includes some twelve hundred acres, is the island park, Belle Isle, of 707 acres. It lies opposite the eastern section of the city, with which it is connected by an iron bridge, erected in 1889 at a cost of $315,000. Nearly a million and a half dollars have been expended in improving the natural features of this park. The beauty of its river location is supplemented by a series of interior lakes and canals, which extend around the island, while a further improvement is projected in the reclamation of the shoal at the western end of the island, which will add at least one hundred acres to its territory. Palmer Park (141 acres) on Woodward Avenue, six miles north of the City Hall, contains a famous log cabin, and other historical relics, and a large colonial casino. It was acquired by gift in 1894. The total park and boulevard area is 1210 acres.

There are several cemeteries in the city, the most notable of which are Elmwood (Protestant) and Mount Elliott (Roman Catholic), both in the eastern section of the city, of great natural beauty and containing handsome monuments.

Institutions. Detroit has, besides numerous public and parochial schools and private secondary institutions of learning, a normal school (city), Detroit College (Roman Catholic), opened in 1877, the Detroit College of Law, the Detroit College of Medicine, which maintains schools of dentistry and pharmacy, and the Michigan College of Medicine and Surgery. The Detroit Bar Library has over 10,000 volumes, and there are several educational and institutional libraries. The public library, founded in 1865, contains over 210,000 volumes, and has established six branches, of which one is in each of the three high schools.

The city has a poor fund, administered by a Poor Commission. There are about thirty private charities. The Detroit Association of Charities is a general organization, representing a number of allied institutions. The House of Correction, which has a plant valued approximately at $500,000, with accommodations for 600 inmates, has a wide reputation as a reformatory institution. Besides the United States Marine Hospital, there are four large general hospitals, including Grace and Harper hospitals, in connection with which are training schools for nurses. Other institutions are Saint Mary's, Red Cross, Sanitarium, and Emergency hospitals, Home for the Friendless, Saint Vincent's Orphan Asylum, Protestant Orphan Asylum, Arnold Home for the Aged and Hospital for Incurables, Thompson Home for Old Ladies, Florence Crittenton Home, Deaconess's Home, and Home for the Aged Poor. In 1894 Detroit originated the scheme of cultivating vacant lots by aid of the unemployed. The success of the experiment led to its adoption in a number of other American cities, in most of which, however, it was conducted by authorized representatives of the municipality, or of charitable organizations, and not as a distinctly municipal enterprise.

COMMERCE AND INDUSTRY. There are a number of conditions which favor Detroit as a commercial and industrial centre. Its position in the southeastern part of the Lower Michigan Peninsula gives it a natural command over the trade of that region, and, at the same time, places it within easy reach of the country to the south; while its location upon the narrow strait leading from Lake Erie to Lake Saint Clair, and thence to Lake Huron, brings it into relation with the immense lake traffic and with the Canadian trade, a number of the railroads of the Dominion naturally making their connection with those of the United States at this point.

Detroit ranks first among the northern border ports in the extent of its foreign trade, and is first in the amount of its exports. For the year ending December 31, 1905, the imports amounted to $5,338,106, and the exports $31,914,006. About three-fourths of the total trade is with Canada, and the larger part of the remainder with England. The principal exports are hog products, including hams, bacon, and lard, manufactures of iron and steel, cotton, corn, lumber, and coal. The number of vessels in foreign trade entering the port in the fiscal year ending June 30, 1905, was 2061, with an aggregate tonnage of 540,916; the vessels clearing, 1989, with a total of 417,094 tons. The river is open to navigation about eight months in the year.

The manufactures are noted for their variety as well as their extent. Among the leading products are automobiles, stoves, freight-cars, adding-machines, alkaline products, drugs, varnish, paint, and oils, some of the establishments that produce these articles ranking among the largest in the world. Detroit has also extensive dry docks and ship-building plants, and a very large seed house. At one time the city was a leading lumber market of the country, and the sawing and planing mill industry was extensive; all this has declined considerably, but there are a number of allied industries, such as the manufacture of furniture, carriages, and matches, which have attained importance. The preparation of furs for market is of less importance than formerly. The tendency of the iron and steel industry to localize near the supply of coal rather than of ore has delayed its development in Detroit, yet the value of the iron and steel, and the foundry and machine-shop products in 1904 was $7,615,045. The manufacture of pharmaceutical preparations and of malt liquors, and the slaughtering industry, though of recent development, have attained considerable dimensions. Other important manufactures are those of chewing and smoking tobacco, cigars and cigarettes, and clothing. The recent industrial growth of the city has been noteworthy; in the thirteen months preceding May 1, 1906, about 100 new manufacturing establishments located there. The capital invested in the various industries in 1906 was estimated at $98,000,000, and the value of the product at $170,000,000.

GOVERNMENT. The government is vested in a Mayor and a unicameral Council, elected biennially. There are a number of administrative boards and commissions, most of which, with other important municipal officials, are appointed by the Common Council on nomination of the Executive. The Board of Health is appointed by the State Governor; and commissioners of public works, parks, and boulevards, and police are appointed by the Mayor. The city clerk, treasurer, justice of the peace, police justices, and members of the Board of Education, who serve for four years, are chosen by popular vote. There is also a Board of Estimates, constituted of two representatives from each ward and five members from the city at large, with certain ex-officio members, which acts upon the general city estimates and all other measures for raising money. The United States District Court for Eastern Michigan sits at Detroit, and the United States internal revenue office and the department in charge of the lake lighthouses, are located here.

FINANCE. The net debt of the city on July 1, 1905, was $5,496,196.21, the per capita debt being exceptionally low. The legal borrowing limit is fixed at 2 per cent. of the assessed valuation. The actual income for the fiscal year 1904 was $6,717,636.05, of which $4,121,982.09 was raised through a property tax, the largest of the other items being special assessments, $439,043.32, and loans, $481,980.40. The expense for maintenance and operation and construction was $5,149,102.34, the expenditure for schools ($1,085,000) constituting the largest item. The city owns and operates its light plant and waterworks. For the fiscal year ending June 30, 1905, the expenditures by the Public Lighting Commission aggregated $218,665.23, of which $121,380.41 was for operation and the balance for extensions. The water-works system comprises some 600 miles of mains, with the pumping station situated at the extreme southeasterly point of the city limits. The supply is taken from the Detroit River. The plant, which was valued in 1906 approximately at $8,000,000, has a daily capacity of 150,000,000 gallons.

POPULATION. Detroit was in 1900 the fourth largest of the Great Lake cities, and ranked thirteenth among those of the United States. The following figures indicate its growth: in 1820, 1422; in 1860, 45,619; in 1880, 116,340; in 1890, 205,876; in 1900, 285,704. Of the last, 96,500 were foreign born, the German and Canadian elements being the largest. About two-thirds of the native born were native white of foreign parents. The colored population numbered only 4100. Population, 1904, 317,591; 1906 (local est.), 360,000.

HISTORY. The site of Detroit was visited by a party of Frenchmen as early as 1610, and again by La Salle in 1670, but no permanent settlement was made until 1701, when Sieur de la Mothe Cadillac, the first Governor of the French territory in this vicinity, built here Fort Pontchartrain, and established a small trading village. On November 29, 1760, an English force, under Col. Robert Rogers, of 'Rogers Rangers,' took possession, and in 1763, from May 9 to October 12, the Indians under Pontiac besieged the garrison, making frequent attacks. After an heroic defense Detroit was saved, being the only frontier post west of Niagara and Fort Pitt which was not captured. In 1778, when a new fort, Fort Lernault, was built, the place had only about 300 inhabitants, all of whom lived in rude log cabins. Throughout the Revolution it was the headquarters of the English forces in the Northwest, and the point from which many Indian expeditions were sent to ravage the frontiers. In 1796 the English abandoned the fort to the Americans, who changed its name to Fort Shelby. After this the settlement grew slowly, and in 1802 was incorporated as a town by the Legislature of the Northwest Territory; but in 1805 it was almost completely destroyed by fire, all the buildings except a warehouse and a bakery being reduced to ashes. On August 16, 1812, the fort was surrendered by General Hull to the English under General Brock. It was evacuated, however, the Americans reoccupying it September 29, 1813. In 1815 Detroit was incorporated as a village, and in 1824 was chartered as a city by the Legislature of Michigan Territory. It was the capital of the Territory from 1805 to 1837, and of the State from 1837 to 1847, when it was supplanted by Lansing.

Consult: Farmer, *The History of Detroit and Michigan* (Detroit, 1889); Burton, *Cadillac's Village, a History of the Settlement, 1701-1710* (Detroit, 1896); chapters in Parkman, *A Half Century of Conflict* (Boston, 1892) and the *Conspiracy of Pontiac* (Boston, 1867); various papers in the *Michigan Pioneer Collections* (Lansing, 1877—); Farmer, "Detroit," in *Historic Towns of the Western States* (New York, 1901).

DETROIT. A city and the county-seat of Becker County, Minn., 194 miles by rail northwest of Minneapolis; on Detroit Lake and on the Northern Pacific and the Minneapolis, St. Paul, and Sault Ste. Marie railroads (Map: Minnesota, C 4). It is in a picturesque lake region, with mineral springs, and good hunting and fishing. Agriculture is the principal industry. Population, in 1900, 2060; in 1905, 2149.

DETROIT RIVER. A river or strait connecting lakes Saint Clair and Erie, flowing nearly west to Detroit and then south, and separating Michigan from Ontario, Canada. It is so called from the French word meaning strait. It is about twenty-two miles long; from one-half to three miles wide, of considerable depth, swift in current; and admits the largest vessels. It is the great waterway, with the Saint Clair lake and river, from Lakes Superior, Michigan, and Huron to Lake Erie. More tonnage of shipping is estimated to pass through this river than through any other stream in the world. There are many islands along its course, and the scenery is very beautiful. See Detroit.

DETROYAT, då′trwä′yå′, Pierre Léonce (1829-98). A French naval officer, journalist, and author, born at Bayonne (Basses-Pyrénées). He studied at the Ecole Navale, took part in the Crimean War, and in the subsequent expedition to China, and accompanied to Mexico the Archduke Maximilian, of whose ill-fated empire he was appointed Under-Secretary of State for Naval Affairs, and chief of the military cabinet. During the Franco-Prussian War he was for a time in command of the camp at La Rochelle. From 1866 to 1869 he was a member of the staff of *La Liberté,* which he edited from 1869 to 1876. He subsequently founded *Le Bon Sens,* and *L'Estafette,* the latter a conservative and Bonapartist journal, and in 1885-86 he edited the *Constitutionnel.* His works include the following diversified titles: *La cour de Rome et l'empereur Maximilien* (Paris, 1867); *Du recrutement, de l'organisation et de l'instruction de l'armée française* (1871); *Le sénat et le scrutin de liste* (1881); *Nos possessions françaises en Indo-Chine* (1887); and *Les chemins de fer en Amérique* (1886).

DETTINGEN, dĕt′tĭng-*en* (Teut., 'the people's home,' from OHG. *diot, diota,* MHG. *diet,* Goth. *þiuda,* AS. *þēod,* people + *ingen,* the patronymic suffix). A village in Bavaria (Lower Franconia), on the right bank of the Main. It is noted as the scene of a battle during the War of the Austrian Succession, June 27, 1743. George II. of England headed the armies of the Allies. Cooped up in a narrow valley, 37,000 English, Hanoverian, and Hessian troops lay, surrounded by 60,000 French on the heights. Noailles's cannon swept the flank and rear of the Allies, and the only exit from the valley, the defile of Dettingen, was held by young De Grammont with 25,000 men. Impatiently charging upon the Allies, he was thrown back with slaughter and confusion. The French loss amounted to 6000 men; that of the Allies to 2000.

DEUCA′LION (Gk. Δευκαλίων). According to the Greek myth, a son of Prometheus, grandson of Japetus, and husband of Pyrrha. The crimes of the race of men then living led Zeus to destroy them in a great flood, but Deucalion, warned by his father, saved himself and his wife in a chest (λάρναξ), which floated for nine days on the waters, and then grounded on Mount Othrys in Thessaly. Other and later versions made Deucalion land on Mount Parnassus, or Athos, or even Etna. Deucalion and Pyrrha now offered up sacrifices to Zeus *Phyxius,* i.e. Zeus, the protector of fugitives, and when Zeus through Hermes promised to grant his wish, he begged for human companions. Bidden to throw the 'bones of their mother,' i.e. the stones of the earth, over their shoulders, they obeyed, and the stones thrown by Deucalion became men, and those by Pyrrha women. The story of Deucalion seems to have sprung up near Dodona, or in Thessaly, where he was said to have settled after the flood. His grave was shown at Athens, where he was said to have founded the temple of Olympian Zeus. Through his son Hellen (q.v.), he became the ancestor of the Greeks. Consult Usener, *Die Sintflutsagen* (Bonn, 1899).

DEUCHER, doiK′ẽr, Adolf (1831—). A Swiss statesman. He was born at Steckborn, Canton of Thurgau, and studied medicine at Heidelberg, Zurich, Prague, and Vienna. In 1855 he became a member of the council of his canton, and in 1868 he served as a member of the council established to formulate a new democratic constitution for Thurgau. From 1869 to 1873 he was a member of the National Council of Switzerland, and, three years after his reëlection to that body became its President (1882) In 1883 he became a member of the Federal Council, and in 1886 was elected President of the Swiss Confederacy, serving until 1887. He was reëlected to that office in 1897 and 1903.

DEUNTZER, Johan Henrik (1845—). A Danish statesman, born in Copenhagen. He fought in the war of 1864 against Germany, became professor of Civil Law at the University of Copenhagen in 1872, and in 1901, when the system of ministerial responsibility to Parliament was first established, became head of the first Liberal ministry. He resigned in 1905 owing to differences in his cabinet.

DE′USDE′DIT, or ADEODATUS. Pope from 615 to 618. He is honored as a saint on November 8.

DEUS EX MACHINA, măk′ĭ-nȧ (Lat., God from a machine, a translation of Gk. Θεὸς *ἀπὸ μηχανῆς, Theos apo mēchanēs*). An expression borrowed from the ancient classical theatre. The tragic poets often employed the intervention of a divinity to solve abruptly a tragic difficulty, and quickly bring about the dénouement. The god was brought on by stage machinery; hence the name. Examples of the use of this device are the appearance of Heracles in the *Philoctetes* and of Athena in the *Iphigenia in Taurica*. From the ancient usage, the term has been extended to mean any device by which a dramatic situation is abruptly solved.

DEUS-RAMOS, dä′oosh rä′môsh, João DE (1830-97). A Portuguese poet, born in the Province of Algarve and educated at the University of Coimbra. His verses, chiefly lyrical, consist of the following collections: *Flores do campo* (1865); *Ramo de flores* (1870); and *Folhas soltas* (1876). He also wrote a *Diccionario prosodico de Portugal e Brazil* (1877). He is one of the most popular of contemporary Portuguese poets.

DEUSSEN, dois′sen, PAUL (1845—). A German philosopher and Sanskrit scholar, born in Oberdreis. He studied at the universities of Bonn, Tübingen, and Berlin, and in 1889 was appointed professor of philosophy at Kiel. His philosophy combines the systems of Kant, Schopenhauer, and the Indian sages. His works include: *Commentatio de Platonis Sophistæ, Compositione et Doctrina* (Bonn, 1869); *Das System des Vedânta* (ib., 1883); and *Der kategorische Imperativ* (Kiel, 1891).

DEUS VULT (God wills it). The rallying cry of the First Crusade, originating in the exclamation of the multitude after the completion of Pope Urban II.'s address at the Council of Clermont, 1095.

DEUTERONOMY. The name of the fifth book of the Pentateuch, derived from the Greek translation of the two Hebrew words in Deuteronomy xvii. 18, which signify 'repetition of the law.' Deuteronomy contains the last injunctions of Moses to his people, delivered in the land of Moab. With the exception of chapters xxvii.-xxviii., xxxiv., and a few verses elsewhere, the book is in the form of an address. There are, however, in reality, three distinct speeches: (a) chapters i.-iv.; (b) chapters v.-xxvi.; (c) chapters xxix.-xxxi.; together with two poems, chapters xxxii. and xxxiii. The book closes with an account of the death of Moses (chapter xxxiv.). It was already recognized by some of the Church fathers, e.g. Chrysostom and Jerome, that Deuteronomy is the book referred to in II. Kings xxii. as having been found in the eighteenth year of Josiah (B.C. 622) by the High Priest Hilkiah. (See JOSIAH.) But while critics are now unanimous in dating the beginning of Deuteronomy from this period, it does not follow that the book, as we have it, was composed in the days of Josiah. In the first place, the law book brought to the King could not have been as extensive as the present book of Deuteronomy. The two poems are clearly additions, and the same may be said of the short prophetic discourse in chapters xxix.-xxxi. and of the blessings and curses, chapter xxvii. There remain the two speeches, (1) chapters v.-xvi., to which chapter iv. 45-49 forms the introduction, and (2) chapters i.-iv. Since the former discourse contains no reference to the latter, the two are independent of one another; other evidence can also be brought forward. Between the two the choice is not difficult. Since Hilkiah speaks of a 'book,' a document of some bulk is evidently intended, and the references to specific laws in the narrative of II. Kings confirm the view adopted by most critics that chapters v.-xxvi. represent the law-book of Hilkiah, which may have been composed in the earlier years of Josiah's reign, or possibly under Manasseh or Hezekiah. This discourse may be again divided into two sections: (a) chapters v.-xi.; (b) chapters xii.-xxvi. The former is an historical narrative put into the mouth of Moses; the latter an exposition of the law. The two divisions, however, formed an organic whole, and everything points to a single origin for them. The historical narrative forms the justification, as it were, for the authority claimed for the law. Naturally, even in this original portion of Deuteronomy, insertions and amplifications have been introduced by those who in the course of time enlarged the book by adding to it the other discourses, the blessings and the curses, and the poems; and who inclosed the whole in an historical frame and attached it to the four preceding books, and to the four following ones, Joshua, Judges, Samuel, and Kings, in order to form one great historical compilation in which the legal code of Deuteronomy and the earlier and later legal codes imbedded in Exodus, Leviticus, and Numbers have been worked in. (See EXODUS; LEVITICUS; NUMBERS; HEXATEUCH.) In these codes three distinct strata are recognized: (a) Exodus xxi.-xxiii., called the Book of the Covenant; (b) Leviticus xvii.-xxvi., the Law of Holiness; (c) the Priestly Law, including the rest of the laws in Exodus, Leviticus, and Numbers. Hence a question arises as to the position to be accorded to the original Deuteronomic code. As a result of the investigations of modern scholars —notably Kuenen, Graf, Wellhausen, and Stade —it may now be regarded as definitely established: (1) that Deuteronomy is older than (b) and (c), but younger than (a); and (2) that the Deuteronomic code is based upon the Book of the Covenant, enlarged and adapted to new conditions and introducing as an entirely new feature the recognition of Jerusalem as the only legitimate centre of Yahweh worship. Everything points to Jerusalem as the place where the original Deuteronomy was written, and there is nothing strange in the supposition that, as a result of prophetic agitation for the purification of Yahweh worship, an attempt should have been made, particularly after the profound impression made in Judea by the catastrophe to the northern kingdom, to formulate an ideal code which should carry out the views of the Yahweh purists; and since the prophets pointed to the days of the wanderings in the wilderness as the period when the people showed the greatest fidelity to Yahweh, it was also natural that the tradition should arise and gather strength which ascribed the Deuteronomic code, as subsequently the other codes, to the great leader of the past—Moses. It is this tradition which, shaping the subsequent history of Israel, gave to the codes their authority in the eyes of the people. How long after this the second discourse, chapters i.-iv., was added has not yet been ascertained by the investigations of scholars, though it probably dates from the exilic period. The same may be said of chapter xxix., while chapter xxviii. appears originally to have been the conclusion to the enlarged book. Chapter xxvii. is an independent composition, which again impresses one as the natural conclusion of a book, and is therefore a 'doublet' to chapter xxviii. It may be admitted that the problems involved in the relationship of these two chapters (xxvii.-xxviii.) to the rest of the book have not yet been satisfactorily solved, and further investigations are needed. Of the poetic supplements, (a) the Song of Moses and (b) the Blessing of Moses, the former is now regarded as an exilic or even post-exilic composition, while the latter is considerably older, and reflects political conditions as they existed in the days of Jeroboam II. (B.C. 782-743), before the disappearance of the northern kingdom.

BIBLIOGRAPHY. See besides the commentaries of Dillmann, Driver, Keil, Oettli, Montet, Steuernagel, etc., Stark, *Das Deuteronomium* (Leipzig, 1894); Steuernagel, *Der Rahmen des Deuteronomiums* (Halle, 1894); Addis, *Documents of the Hexateuch*, vol. ii. (London, 1898).

DEUTSCH, doich, EMANUEL OSCAR (1829-73). A distinguished Semitic scholar. He was born of Jewish parents, at Neisse, in Silesia. His education was begun by an uncle, to whose inspiration he owed his interest in Oriental languages and literature, and was finished at the University of Berlin. In 1855 he was called to England to fill an appointment in the library of the British Museum and labored there until his death in 1873. He acquired an extraordinary mastery of the whole range of Hebrew, Aramaic, and Rabbinical literature, and is best known for his articles on the Talmud and Islam in the *Quarterly Review*, and also wrote excellent articles on the Targum and the Samaritan Pentateuch for Smith's *Dictionary of the Bible*. The monument of his official work in the British Museum is to be found in the *Phœnician Inscriptions*, edited by Mr. Vaux, to whom Deutsch rendered most valuable assistance. His engrossing public duties and comparatively short life prevented Deutsch from fulfilling the dream of his life, an elaborate work on the Talmud. Consult his *Literary Remains*, containing reprints of his most important articles, with memoir (London and New York, 1874). The essay on the Talmud has also been reprinted by the American Jewish Publication Society, *Special Series No. 3* (Philadelphia, 1897).

DEUTSCH-BROD, doich′brōt. The capital of a district in Bohemia, Austria, on the Sazawa, 15 miles north of Iglau. It is an industrial centre, with woolen, lumber, and grist mills, glass-works, breweries, etc. In the fourteenth century it was noted for its silver-mines. The chief event in its history is the defeat of the Emperor Sigismund by Ziska in 1422, and the destruction of the town by the Hussites. Population, in 1900, 6526.

DEUTZ, doits. See COLOGNE.

DEUTZIA, dūt′sĭ-a *or* doit′sĭ-ȧ (after the Dutch botanist *Deutz*). A genus of shrubs of the natural order Saxifragaceæ, natives of the north of India, China, and Japan. They produce an abundance of beautiful white flowers. The leaves of Deutzia scabra are so rough with siliceous hairs that they are used by joiners in Japan for polishing wood. Deutzia scabra and Deutzia gracilis are common ornamental shrubs in the United States. Other species are often used for forcing in greenhouses.

DEUX-PONTS, dẽ′pôɴ′. See ZWEIBRÜCKEN.

DĒV, dāv, less accurately **DĒW**, or **DĪV**. The Persian word for demon, identical with Avestan *daēva*, and the same as Sanskrit *dēva*, although the latter means god, not demon. According to Zoroaster the Daēvas were created by Ahriman (q.v.), and in Firdausi's Persian epic, *Shāh Nāmah*, the Dēvs are a constant source of guile, cunning, evil, and alarm. The difference in meaning between the usage of the word in Iran and India has been much discussed. See AVESTA; ZOROASTER.

DE′VA. The old Roman name for Chester and the river Dee.

DĒVANĀGARĪ, dā′vȧ-nä′gȧ-rē, or NAGARI. The name given to the character in which Sanskrit is generally written, especially in northern and middle India. The Hindus commonly employ the second term rather than the first. The word *nāgarī* means 'of the city, urban' (writing); *dēvanāgarī* signifies '(writing) of the divine city.' As the Arab chronographer Albīrūnī in his account of India (about A.D. 1030, trans. Sachau, i. 173) mentions a kind of writing called *Nāgara* as in use in Mālwa, whose chief city is Ujjain, it has been thought that the name of this script, *urban*, *urbane*, may possibly have some connection with King Vikrama's capital, which was a famous seat of learning and literature. The Nāgarī alphabet consists of forty-eight letters, and it is written from left to right. It is believed to have assumed its present characteristic form about the eighth century A.D., and, like the other Hindu scripts, it is traceable back to the oldest form of Indian alphabet, the *Brāhmī lipi*, or Writing of Brahma, which is known from coins and inscriptions of about B.C. 350. The Brahmī itself is held to be an adaptation of a form of Semitic writing that may perhaps have found its way into India as far back as the eighth century B.C. In modern times the earliest instance yet recorded (1902) of Dēvanāgarī letters being employed in a printed European book is found in five tables contributed to Kircher's *China illustrata* (Amsterdam, 1667) by Heinrich Roth, a German who had lived a number of years in India as a missionary. On the Nāgarī script and its paleographic sources, consult the standard work of Bühler, *Indische Paläographie* (Strassburg, 1896). See ALPHABET; SANSKRIT.

DEVAUX, de-vō′, PAUL LOUIS ISIDOR (1801-80). A Belgian statesman. He was born at Bruges, and was educated at Liège. The establishment of the so-called 'Doctrinal Party' after the Revolution of 1830 was largely due to his efforts and to those of his chief associates, Rogier and Lebeau, with whom he had six years previously founded the *Journal Politique*. This publication, by unifying the Liberal and Catholic elements, agitated the opposition to King William I. of the Netherlands, and eventually became largely instrumental in promoting the separation from Holland and the establishment of an independent government. Devaux assisted in framing the Constitution, and in 1831 became Minister of State, from which position he resigned upon the installation of King Leopold. He later became the head of the Moderate Liberals in the Chamber, and for many years conducted the official organ of that party, the *Revue Nationale,* founded by him in 1840. Toward the close of his career he was stricken with blindness.

DÉVAY, or **DÉVAI** (i.e. of Déva), MÁTYÁS BIRÓ (c.1500-74). The founder of the Reformed Church of Hungary. He was born at Déva, Transylvania, studied theology at Cracow, became a priest, but in 1529 embraced the Reformation, and spent nearly two years with Luther at Wittenberg. On his return home he preached the new faith boldly and at the risk of his life until, in 1534, he came under the protection of a powerful noble. In 1541 he fled to Switzerland to escape the oncoming Turks, and there imbibed Zwinglian views of the sacraments, much to Luther's sorrow. He died at Debreczin, Hungary, where he had faithfully labored for a few years.

DEVELOPMENT, EMBRYONIC. See EMBRYOLOGY; GASTRÆA THEORY.

DEVELOPMENT, EVOLUTIONARY. See EVOLUTION.

DEVELOPMENT IN PHOTOGRAPHY. See PHOTOGRAPHY.

DEVELOPMENT OF DOCTRINE. The process by which Christian doctrine has been slowly and successively divided into different departments of thought, these one after another more carefully defined, subdivided, and elaborated, and more thoroughly grounded in revelation and reason, and the whole thereby reduced to a systematic and relatively complete form.

The fact of such a development is at once evident upon the most superficial examination of Christian history. The earliest writers of the Church possess no system of theology, and employ few expressions which indicate any thought upon the great questions with which theology is engaged. By the time of Irenæus (died c.202), the beginnings of an organization of thought are manifest. By the early part of the fourth century (Council of Nice, etc., 325 and onward) the doctrines of God and of the Trinity have come to be distinctly treated, and their ultimate elements discriminated and defined. The middle of the fifth sees Christology defined at Chalcedon (451), and the first half of the sixth the doctrine of anthropology at Orange (529). Much further development went on in the Middle Ages which is a ground of dispute between Catholics and Protestants, the latter viewing it as a perversion of the true line of evolution. During this period the great features of the Catholic sacramental system were settled. Then came the Protestant Reformation, when the advancing movement was, as Protestants maintain, resumed. Now, the doctrines of the application of grace, justification, etc., were redefined by Luther (1517), and the doctrine of the ground of forgiveness, the atonement, was again stated upon the basis already laid down by Anselm (1098). The Reformation era as a whole, reaching down to the close of the Thirty Years' War, was a very productive period theologically, when processes of thought long in course of elaboration were brought to a more or less satisfactory conclusion. Hence even ecclesiology and eschatology were included in the topics substantially treated in this era.

In certain respects this development is parallel to all development, and may be described even with Spencer's phrases, as increasing heterogeneity accompanied by increasing coherency of each separate department of thought. It has another marked point of likeness with all other development, in that it has parts which must be recognized as abnormal development, as 'degeneration' rather than progressive evolution. Gnosticism, and the long train of like forms which have followed it even down to our own day, was one of these. The Reformation itself had its abnormal perversions in the fanatical wing of the Anabaptists and the like. It becomes, therefore, important to establish criteria by which the sound and progressive development of doctrine may be discriminated, in order that its results may be used in the construction of systems of theology with confidence that they will prove sound and enduring elements of truth. For it is only as the present can build upon the past, and positions once really gained can be employed by subsequent thinkers, that there can be any hope of substantial growth in the knowledge of Christian truth from age to age. Four such criteria seem possible and practical. First, the development must begin from a germ actually present in the definite instruction of Jesus Christ to his Apostles. Christianity is a religion of revelation (q.v.), and possesses from its foundation the essential and fundamental materials of all theology. To begin with anything not so revealed is to begin with uninstructed human reason, and to run the danger of disastrous failure. Second, it must proceed according to the laws of logical sequence. The doctrines must follow upon one another in such a way that the fundamental shall precede the later which are built upon them, as theology actually preceded Christology; and they must also be logically proved, that is, follow in a rational sequence. Third, each doctrine must agree with previously established Christian doctrines, since it is a system of truth which is being developed, and truth is harmony. And, fourth, its developed form must agree with its original in substance and vital portion, or a later doctrine must not contradict any doctrine previously established. The great system of evangelical theology as embraced in the great Protestant confessions (apart from the philosophical form in which it is expressed and conceptions by which it is supported) is believed by Protestants to satisfy all these conditions of a sound development. See DOGMA.

This view of development is founded upon the presupposition that the Holy Spirit is in the Church guiding it into the knowledge of the truth, as was promised by the Saviour should be the case (John xvi. 13). A very prominent school of Church history at the present time, of which Harnack, professor in Berlin, is the most eminent representative, lays little emphasis upon this idea, or wholly discards it, and seeks to explain the course of history by purely natural causes. Thus the idea of specific revelation is denied or at least obscured, the miraculous element of original Christianity rejected, and the whole historic process regarded as mingled so largely with error that its outcome is of little or no value for the ascertainment of truth. Christianity is thus simply one of the elements of civilization and is to be subjected to precisely the same canons of criticism as every other; and current Christian doctrine is regarded as needing fundamental and extensive reform. The question between these two schools is the question of the reality and meaning of the supernatural. Consult: Cardinal Newman, *An Essay on the Development of Christian Doctrine* (London, 1878), and criticism by Prof. F. H. Foster in his *Christian Life and Theology* (New York, 1901).

DEV′ENS, Charles (1820-91). An American jurist. He was born in Charlestown, Mass., graduated at Harvard in 1838, and was admitted to the bar in 1841. He was a member of the State Senate in 1848-49, and from 1849 to 1853 was United States marshal for the district of Massachusetts. In this capacity he was called upon in 1857 to remand Thomas Sims (q.v.) to slavery, and strongly against his own inclination caused the process to be executed, but subsequently made every effort to secure Sims's freedom. He served with the Union Army in the Civil War from 1861 to 1866, rose from the rank of major to that of brigadier-general, and was brevetted major-general for gallantry. He then resumed the practice of law, was associate justice of the Superior and Supreme courts of Massachusetts from 1867 to 1877, and was United States Attorney-General under President Hayes from 1877 to 1881. From that time until his death he was again in the State Supreme Court. He was a brilliant orator and public speaker. In 1886 he presided over the exercises in celebration of the two hundred and fiftieth anniversary of Harvard.

DEV′ENTER. A thriving town of Holland, situated on the Yssel, 66 miles east of Amsterdam (Map: Netherlands, E 2). The town retains the mediæval plan of streets, but is very neat. The principal buildings are the cathedral (a structure in the early Gothic style), the town house, the court-house, and the Gothic weigh-house, now a high school for girls. There are a number of carpet factories and a Royal Smyrna rug factory. The town is also famous throughout the country for its honey cakes, a kind of gingerbread, called 'Deventer koek.' Other industries are iron-molding, and metal-case and glue making. There is also a large trade in grain, linen, and animal products. Population, in 1890, 23,220; in 1900, 26,212; in 1905, 27,617. Deventer is mentioned as early as the Eighth Century, when it was taken by the Saxons. It was the seat of a bishopric from 1559 to 1591.

DE VERE, Sir Aubrey (1788-1846). An Irish poet. He was the son of Sir Vere Hunt of Curragh Chase, Limerick, Ireland. In 1832 he took the name of De Vere. He studied under a tutor at Ambleside, and subsequently at Harrow. His sonnets were greatly admired by Wordsworth. He also wrote three dramatic pieces: *Julian the Apostate* (1822); *The Duke of Mercia* (1823); and *Mary Tudor* (posthumous, 1847). See *Sonnets* (1875) and *Mary Tudor* (1884), edited by his son, Aubrey Thomas de Vere (q.v.). Consult: Gunning, *Aubrey De Vere* (Limerick, 1902); Ward, *Aubrey De Vere* (New York, 1904).

DE VERE, Aubrey Thomas (1814-1902). An Irish poet, son of Sir Aubrey De Vere, and second Baronet of Curragh Chase, Limerick. Educated at Trinity College, Dublin, he first appeared as a poet in 1842, with *The Waldenses, or the Fall of Rora, a Lyrical Tale*. Next year his *Search After Proserpine* made him widely and favorably known as a writer of verse, graceful, refined, and fluent. Among later volumes are: *Poems, Miscellaneous and Sacred* (1853); *May Carols* (1857); *Irish Odes* (1869); *The Legends of Saint Patrick* (1872); *Legends of the Saxon Saints* (1879); and *The Foray of Queen Meave and Other Legends of Ireland's Heroic Age* (1882). De Vere also published poetical dramas on *Alexander the Great* (1874) and *Saint Thomas of Canterbury* (1876); *Essays Chiefly on Poetry* (1887); *Essays Chiefly Literary and Ethical* (1889); *Recollections* (1897); and other works on Irish ecclesiastical politics and literary criticism. As a poet he was inspired by Wordsworth. He was a classical scholar of fine culture, and his appreciation of the Greek spirit is manifest in all his work relating to those ancient myths. Of permanent practical achievement may be mentioned his interest in the Celtic renaissance, and not the least attractive of his poems are those reviving the beauty of Irish legend. Consult: *Recollections* (London, 1897); Brooke and Rolleston, *Treasury of Irish Poetry* (New York, 1900).

DE VERE, Maximilian, Baron von Schele (1820-98). An American philologist. He was born in Sweden, studied in Germany, and in 1842 emigrated to the United States. In 1844 he became professor of languages at the University of Virginia, but during the Civil War entered the Confederate Army, and afterwards acted as the commissioner of the Confederacy in Germany. At the close of the war he resumed his professorship. He was one of the founders of the American Philological Society, and published: *Comparative Philology* (1853); *Americanisms* (1871); *Romance of American History* (1872); several translations from Spielhagen; and X. B. Saintine's *Myths of the Rhine* (1874).

DEVEREUX, dĕv′ẽr-ē̆, Penelope. See Stella; also, Dark Lady, The.

DEVEREUX, Robert. See Essex, Third Earl of.

DEVI, dā′vē̇ (Skt., goddess) or **MAHADEVI,** mä′hȧ-dā′vē̇. In Hindu mythology, the wife of Shiva, also called Durga and Parvati.

DEVIATION (Lat. *deviatio*, from *deviare*, to go out of the way, from *de*, off + *via*, way). The deflection of the compass-needle, due to local attraction, such as the magnetic forces of an iron or steel ship. It consists of two parts, that produced by permanent magnetism of parts of the vessel's structure, and that produced by induced magnetism in other parts. The *angle of deviation* is the angle between the magnetic meridian and the compass-needle. (See Compass; Declination; and Magnetism, Terrestrial.) The term also may signify a departure from the usual course of a voyage without justifiable cause; if lack of sufficient cause is proved, the insurers are discharged from all further responsibility. It differs from a *change* of voyage, which is planned and decided upon before the sailing of the ship. Permission to touch at, stay at, or trade in any particular place not in the usual course of the voyage must be expressly given in the contract. Deviation is justified by the following causes: (a) Stress of weather; (b) urgent need of repairs; (c) to join convoy; (d) to succor ships in distress; (e) to avoid capture or detention; (f) sickness; (g) mutiny of the crew.

DEVIATION OF THE PLUMB-LINE. An effect observed when a plumb-line is suspended in the vicinity of cliffs or mountains. It consists in the line being drawn out of the perpendicular, evidently by the attraction of the mountain. It has been observed that the deflection is greater near an island mountain than near an inland continental mountain, and this is attributed to the fact that the water surrounding the island is lighter than the mountain mass, which thus exerts a stronger attraction comparatively than if it were surrounded by land. Practically the same phenomenon is observed on plains, and is thought to be due to the presence of caves, or of large masses of matter whose density varies from the average value of that of the earth.

DEVICE (ME. *devise;* OF. *devise*, will, intention, *devis*, division, plan, will, from Lat. *divisus*, p. part. of *dividere*, to divide). An emblem which, with its accompanying motto or legend, was assumed as an ingenious expression of some particular conceit of the wearer, generally containing a hidden meaning. Devices became general in the fourteenth century, and reached their full development during the period of the French wars in Italy. Mary Stuart solaced her captivity by inventing devices which she afterwards executed in embroidery. A device was composed of two parts, the body and soul, as they were called by the Italians. The 'body,' or painted metaphor, was not to represent the human form, but was to be pleasing in appearance. The 'soul' was to be short, and in a foreign language. The combined emblem was not to be so plain as to be understood by all, nor so obscure as to require a Sphinx to interpret it. Devices were borne only by the person who assumed them, and not, like the crest or cognizance, by his family or descendants. As example: Louis XIII. of France had a falcon as a device, with the words *Aquila generosior ales* (a nobler bird than the eagle), by which he implied a claim of superiority to the Emperor; Louis XIV. had the sun in its splendor, with the motto *Nec pluribus impar.* Consult Radowitz, *Die Devisen und Mottos des spätern Mittelalters* (Stuttgart, 1850).

DE VIGNY, de vê'nyē', ALFRED, Comte. See VIGNY, ALFRED, Comte de.

DEVIL, or SATAN (OE. *dēofol*, Lat. *diabolus*, Gk. *διάβολος*, *diabolos*, slanderer, from *διά*, *dia*, across + *βάλλειν*, *ballein*, to throw; Heb. *Sātân*, adversary, from *satan*, to persecute). In the Old and New Testaments, a mighty spirit of evil who has, during unknown ages, ruled over a kingdom of evil spirits, and is in constant and restlessly active opposition to God. This belief, however, was very gradually developed in the Jewish mind; and it is beyond all question that it acquired clearness and prominence through extra-national influences. The older Hebrews who lived before the period of the Babylonish captivity—judging from the silence of Scripture—knew nothing, and certainly taught nothing, of evil spirits in the later sense—i. e. of beings separated from God, who were evil in the essence of their nature, and worked evil only. *Moral* evil was rather looked upon as properly the act of man; *physical* evil, or adversity, on the other hand, as punishment merited through sin, and inflicted by a just and holy God, who was thus necessarily conceived as the true source of all calamity. The angels who foretold God's purposes, and executed His will, however great might be the physical evil they occasioned, are never accused of *moral* evil. Even in the Mosaic account of the seduction of Eve, there is nothing to induce us to believe that the author regarded the serpent other than as 'the most subtle of all the beasts of the field,' or that he meant to conceal under so plain a statement an allusion to Satan. It is probable, however, that at some early period in their history the popular faith of the Jews, partly divorcing itself from its grand religious conceptions of the 'one living and true God,' and lapsing into petty superstitions, had become familiar with the idea of certain fearful, unearthly beings haunting wildernesses, similar to the fauns and satyrs of Greece, who might form the connecting link in the later development of an actual demonism. Traces of this are clearly visible in the Pentateuch. The Hebrew word *seirim*, occurring in Lev. xvii. 7, which the translators have rendered 'devils,' means only 'hairy ones.' Now the Egyptians worshiped the *he-goat*, and the Hebrews partook, as we know, of their idolatry. Therefore Moses in this verse, forbidding them to commit this sin in future, says: "They shall *no more* offer their sacrfices to *seirim*"—i. e. to the Egyptian he-goats. The development of demonism was materially furthered during and after the Babylonish captivity by Medo-Persian influences. In those canonical books of the Old Testament which belong, in their present form, to the post-exilic period—i. e. the period subsequent to the exile—the Jewish conceptions of angels become more definite. They possess different ranks, names, and specific offices. They are the tutelary guardians and helpers of particular lands and peoples, but are everywhere in absolute dependence on God. And now we meet also, for the first time, with an angel called *Satan*, who, however, still figures as a minister of God, and, along with the others, appears in heaven before the throne of Jehovah, but with the function assigned to him of accuser and seducer. It is he who (I. Chron. xxi. 1) stirs up David to number the people; while in the older Hebrew version (II. Sam. xxiv. 1) the same act is attributed to an angry God, the conception of Satan not *then* having clearly, if at all, presented itself to the Hebrew mind. It is Satan also who throws suspicion on the piety of Job, and, with the permission of Jehovah, causes a series of misfortunes to befall him (Job i. 2); while in Zach. iii. 1 he is represented as 'resisting' the angel of God, and as a false accuser of the high priest Joshua. As yet, however, an evil nature is not *expressly* ascribed to him, but, what is much the same, it is assumed that he takes a pleasure in active evil. It is a purely arbitrary and untextual interpretation of Isaiah xiv. 12 ("How art thou fallen from Heaven, O Lucifer, son of the morning!") that would force these words to refer to the fall of the Devil, or determine from them his name. In the Apocrypha, of which only a small part is Palestinian, the rest being either *Chaldaico-Persian* (as, for example, Tobias and Baruch) or *Ægypto-Alexandrian* (as, for example, Wisdom) in its origin, the older Hebrew doctrine of misfortune coming from the angel of Jehovah is, so to speak, dismembered and demons or evil spirits, in the New Testament sense of the term, are for the first time mentioned (and in Tobias and Baruch frequently) as the authors of calamities. According to the representations of these writings, the evil spirits dwell, like the older Hebrew hobgoblins, in waste places, but associate themselves for the injury or destruction of men, enter into them as tormentors, and can be expelled only by magical or mysterious means. To this class of beings the heathen deities were reckoned to belong. But even here there is no mention of an *organization* or kingdom or prince of demons. The first trace of a *Diabolos* or Devil proper (and one in all probability springing from a foreign source) shows itself in the Book of Wisdom (ii. 24), in relation to the seduction of Eve, where it is said that through the Devil the necessity of death has come into the world.

In the period elapsing between the close of the Apocrypha and the appearance of Jesus, the Jewish ideas of angels, as well as of demons and the Devil, received an extensive development. This angelology and demonology, wholly foreign to the older Hebrew religion, was derived in all its essential characteristics from the system of Zoroaster, with which the Jews had become familiar by their long and close intercourse with the Persian empire during the exile, and subsequently. It was, however, impossible to transfer the *dualism* of Zoroaster into a creed so purely *monotheistic* as that of the Jews; this would have destroyed the foundation on which their entire history rested. Two beings, equally eternal, equally powerful, was an idea which no Hebrew—mindful of the glorious deliverance of his forefathers out of the land of Egypt, of the law given amidst the thunders of Sinai, of the manna in the wilderness, of the triumphs in Canaan, and the Golden Psalms of David—could for one moment entertain. But, on the other hand, now that as a nation the Jews were become weak and of little account, hemmed in, and crushed by mighty and advancing empires, no conception could seem more true, or prove more consolatory, than that which permitted them to attribute their misfortunes to the agency of a demoniacal race, headed by a potentate only inferior to Jehovah himself. They could now believe that God had not forsaken His 'chosen people.' Thus, the dualism of Zoroaster suggested the kingdom and royalty of Satan, but the doctrine shaped itself in harmony with the national monotheism. The Devil and his demons were represented as having been originally *angels*, who had fallen from their 'high estate,' been punished by God, and had therefore assumed a position of hostility, without, however, being able materially to frustrate the divine purposes. These opinions found an almost universal reception among the people, as well as among those Jewish theologians who, along with the Mosaic law, held oral tradition to be an authentic source of religious doctrine. Indeed, the only Jewish sect which rejected them was that of the Sadducees, who considered them, as also the doctrines of the resurrection from the dead, of the Messiah, of the Messianic kingdom, of the last judgment, of rewards and punishments, and of angels and demons, to be new, outlandish anti-Mosaic myths and theories. This conflict of opinion among the Jews prevented their ideas of the Devil and demons from obtaining, in spite of their broad diffusion, a dogmatic and systematic stability. The populace and the Pharisees believed fervidly in the existence of such evil spirits; but their conceptions had not only all the heat, but all the confusedness of superstition.

The New Testament contains distinct recognition of the prevalence of this extended popular demonology, by which, in particular, various diseases were ascribed to the agency of the evil spirits. Whether this is by accommodation to the ideas of the times has been much discussed, and the solution will depend upon the prevailing conception of the nature and character of Christ. Whatever place the New Testament means to give to the lesser demons in the course of human history, its teaching as to the existence and evil influence upon humanity of the chief evil spirit is beyond question. He bears a great variety of names, as Satan (Matt. iv. 10, etc.), the Devil (as Heb. ii. 14), the Adversary (I. Pet. v. 8), the Enemy (Matt. xiii. 39), the Adversary (1. Tim. v. 14), the Accuser of the Brethren (Rev. xii. 10), the Old Serpent (Rev. xx. 2), the Great Dragon (Rev. xii. 9), frequently Beelzebub (Matt. x. 25), once Belial (II. Cor. vi. 15). These names describe well the character imputed to him. He is the 'evil one,' the 'tempter,' who opposes Jesus and seeks to draw the disciples as well as their Saviour into sin, has power over the world, of which he is the 'Prince' and 'God,' and shows his power in the moral corruption of heathenism. Even in respect to him, popular ideas are allowed to come in, as when his habitation is said to be the 'air'; but such elements do not affect the main teaching of the New Testament. See DEMONIAC.

The primitive Church assumed the personality of the Devil as an unquestionable fact. The New Testament ideas on this point were not only greatly enlarged, but in many respects entirely changed, partly through the introduction of a considerable number of heathen notions, and partly through the dogmatic tendencies of the time, in consequence of which the various statements in the Bible regarding Satan and evil were uncritically and unhistorically heaped together, and a doctrine of Satanic agency elaborated logically. Holding firmly to the belief of a Satanic kingdom of darkness opposed to Christ's kingdom of light, the majority of the early Christians ascribed all evil, physical as well as moral, to the Devil and his demons; failures of the crop, sterility, pestilence, murrain among cattle, mental maladies, persecutions of the Christians, individual vices, heresies, astrology, philosophy, and especially the whole body of heathenism, with its mythology and religious worship. The heathen gods were believed to be conquered by the work of Christ, but not to be wholly powerless; they sank down into demons, and so a part of their mythology passed into the doctrine of the Devil. It was they who, as demons, meaning to deceive, uttered oracles, were present at sacrifices, and inhaled the sacrificial incense. The doctrine of the lordship of the Devil over the human race, so far as it was unregenerate, gave rise to the custom of exorcising, not only those in whom special signs of demoniacal possession appeared (see ENERGUMENS), but all candidates for baptism, whether infants or adults. (See EXORCISM.) But while the power of the Devil over all not guarded by Christian faith and rites was supreme, over those who were so protected it was utterly weak. No Christian, even the weakest, could be forced to do evil; and the sign of the cross, the commemoration of Satan's defeat in the decisive combat, sufficed to put him to flight. The lives of the saints, especially during the Middle Ages, are full of narratives of encounters with the Devil, under sometimes a seductive, sometimes a terrifying form; and one of the best-known incidents in Luther's life is his single combat with him in the Wartburg, when the enemy was said to have been put to flight by a well-aimed inkstand.

The fall of the Devil from his former estate of an angel of light has been a subject much discussed by theologians. Some assert that he was originally the highest of all the angels; others, the prince of one of the lower orders. The sin of the angels is generally supposed to have been pride; this view is based not only upon the indications of Scripture, but upon this being the most probable temptation for their incorporeal nature. Some assert that their revolt took place upon the revelation to them that in the divine counsel it was intended that God should assume a nature lower than theirs, that of man. While the problem of the origin of evil is often considered insoluble, there is a certain plausibility in the view that evil was thus primarily nothing more than the choice by the angels of lower good, their own glory, in preference to a higher, the glory of God. Evil would then have diverged more and more from good as time went on, until it assumed the features of positive and repulsive enormity of some of its manifestations. Some theologians assert that the angels had and refused one chance of repentance; but it is more generally believed that the high perfection of their nature made their act decisive and irrevocable.

The old German and Norse mythologies poured a flood of heathen fancies into the 'doctrine of the Devil.' Even Ulfilas, at a much earlier period, had translated the New Testament word *daimon* or *daimonion* by *unhulthó*, i. e. she-devil or sorceress, because the old Germans believed in *female* demons, while the Christian *usus loquendi* contains no trace of such. The peculiarly German conception of a now malignant, now gentle *female* lives to this day in the German phrase, "The Devil is beating his mother" (when rain and sunshine quickly alternate). In England and Scotland, too, the phrase is or recently was current, "The Devil and his dam." The Germans have also the proverb, "Where the Devil cannot come, there he sends his grandmother." Soon, however, the word *diabolus*, in violation of the New Testament distinction between it and *daimon*, came to signify devils of every or any sort. The dwelling of the Devil was hell, which, however, according to old Germanic and Scandinavian notions, was placed in the dreary regions of the north. Although his mischievous powers are to be pretty well controlled till the coming of Antichrist, when he expects to hold carnival, yet, like ancient gods and demons, he occasionally appears on the earth. He then assumes at times a purely human form, but, like Vulcan, who was thrown down from heaven like himself, and the smith, Wieland, of German mythology, he is somewhat lame. He is covered with a gray, green, or red cloak, like the kobolds and dwarfs (see GIANTS and DWARF), the spirits of the suppressed heathenism; sometimes, also, he appears black and sooty, as befits his dwelling-place and his opposition to a pure God. But as the old deities, both classical and German, possessed the power of transformation to a most remarkable degree, the Devil, through his relationship with these, inherited this power when they vanished from the scene. The form he most frequently assumed was that of an animal, approximating, in this respect, to the German forest spirits and the Greek satyrs and fauns. At one time he shows the foot of a horse or goat with horns and tail; at another, he appears as a black horse, a he-goat, a hog, a wolf, a hell-hound, a raven, a serpent, a worm, a dragon, or a fly. The conception of the power of the Devil was vastly enlarged by the influx of these new fancies. In fact, it rose almost to a new dualism; but on the other hand, also, many mild and friendly traits of the heathen gods passed over into the popular conception of the Devil, and gave to his nature a quite new, humorous, and even merry side. As, after the introduction of Christianity, offerings were still occasionally made to the old gods, the Devil shared in these honors. A horse, a he-goat, or a hound was at times sacrificed to him; and to the present day the expression has survived, "To kindle a fire for the Devil"—obviously an allusion to altar-flames. Various features of the old Norse gods, especially of Loki and Donar (Thor), the gods of fire and thunder, were also transferred to him. Hence the still current phrases in Germany when thunder is heard: "The Devil must be striking," and "The runaway goose is gone to the Devil." (*Donner*, 'thunder,' is the word used for devil in this case.) Every power, too, which, according to the older heathen belief, was lodged in the lesser demons, giants, etc., had now its proper centre in the great fiend himself, who could perform all the pranks attributed to the more grotesque creations of the Norse mythology, and work all the evil of the more malignant spirits; but, in general, these beings were rather pressed into his service than absorbed by him or incarnated in his person.

So did this great, originally Persico-Judaic belief spread itself through all Christian lands, incorporating with itself, first, the kindred conceptions of the ancient classical world, and, ultimately, the rich and varied superstitions of our Teutonic and Scandinavian forefathers. Thus decked out in the costumes of many different climes and ages, the image of evil passed into the light of the modern world. Every step forward that it now took robbed it of some potent spell that used to chill the blood and strike the heart with awful horror. Men first lost faith in the Devil's occasional incarnation; then medical science destroyed his claims to the origination of mental phenomena, which he was once supposed to have caused directly; natural science deprived him of his control over the elements; historical criticism plucked from him his borrowed feathers; while metaphysics and a deeper religious exegesis have combined, not, perhaps, to annihilate his personality or deny his influence, but certainly to clothe the former with a more spiritual form, and to limit the latter by a reverential belief in the wisdom and goodness of God. Consult: Mayer, *Historia Diaboli* (Tübingen, 1780); Horst, *Dämonologie* (Frankfort, 1818); id., *Zauberbibliothek* (Mainz, 1821-26); Grimm, *Deutsche Mythologie* (4th ed., Berlin, 1875-78); Conway, *Demonology and Devil-*

Lore (London, 1878); Lecanu, *Histoire de Satan, sa chute, son culte, ses manifestations, ses œuvres* (Paris, 1861); Carus, *History of the Devil* (Chicago, 1900); and see Demonology; Witchcraft; Angel, etc.

DEVIL, Tasmanian, or Devil-Devil. See Dasyure.

DEVIL, The. Once a tavern near Temple Bar, in Fleet Street, London, the former place of meeting of the Apollo Club (q.v.). Child's Bank now stands on its site.

DEVILFISH. A name applied to various large marine creatures of terrifying or grotesque appearance. (1) Any of various large cephalopods. See Kraken; Octopus; Squill. (2) The gigantic ray (*Manta birostris*). See Ray. (3) The angler (Lophius), and its relatives. See Angler.

DEVIL-IN-A-MIST. See Nigella.

DEVIL IS AN ASS, The. A comedy by Jonson (1616), the avowed object of which was to substantiate the thesis laid down by the title.

DEVILLE, de-vēl'. See Sainte-Claire Deville.

DEVILLE, Jean Achille (1789-1875). A French scholar, born in Paris. He became director of the museum in Rouen. He wrote works on local history and archæology, such as an *Histoire du Château-Gaillard* (1829), and *Tombeaux de la cathédrale de Rouen* (1838), as well as an *Essai sur l'exil d'Ovide* (1859), and an *Histoire de l'art de la verrerie dans l'antiquité* (1874)—the last-named volume, finely embellished with numerous plates, being his best.

DEVIL OF ED'MONTON, The. See Merry Devil of Edmonton, The.

DEVIL'S ADVOCATE. See Advocatus Diaboli.

DEVIL'S-APRON. The large brown algæ, usually called 'kelps,' in the order Laminariales. See Phæophyceæ; Algæ.

DEVIL'S BIBLE, The. The name given to a manuscript Bible taken to Stockholm after the Thirty Years' War. It is beautifully written on 300 asses' skins, and the legend makes it the work of a monk condemned to death, who by selling himself to Satan was enabled to save his life by meeting the condition that he should copy the whole Bible on asses' skins in one night.

DEVIL'S-BIT. See Scabious.

DEVIL'S BRIDGE (translation of Ger. *Teufelsbrücke*). A curious bridge formerly in the Canton of Uri, Switzerland, over which the road to Italy crossed the Reuss at a point where there are often violent gusts of wind (Map: Switzerland, C 2). Built in the Middle Ages, it was partially destroyed by the French in 1799, in which year it was the scene of fierce conflicts between them and the allied Austrians and Russians. The remains of the bridge were carried away by a flood in 1888. 'The Hole of Uri' is the name given to the tunnel near by, through which the road passes. The new bridge was built close to the old site in 1830, and a monument to the Russian general, Suvaroff, was erected in 1899 in a niche above.

DEVIL'S CLAW. A heavy split hook attached to a chain or hawser and used for working the chain cable in mooring, unmooring, clearing hawse, etc. The points of the hook pass on each side of one link and grip the next one at right angles to it. The chain or hawser is secured to a bitt, ring-bolt, capstan, windlass, or the like.

DEVIL'S CLUB. See Aralia.

DEVIL'S COACH-HORSE or Cow. A rove-beetle (*Ocypus olens*) common in Great Britain. See Rove-Beetle.

DEVIL'S DARNING-NEEDLE. See Dragon-fly.

DEVIL'S DOZEN. See Baker's Dozen.

DEVIL'S DYKE. (1) A prehistoric earthwork in Cambridgeshire, England, built as a barrier between the Mercians and the East Anglians. (2) A natural formation near Brighton, said by a legend to represent the attempt of the Devil to let in the waters in order to inundate the country.

DEVIL'S-FINGER. A British name for (1) a belemnite; (2) a starfish.

DEVIL'S ISLAND. A small barren island off the coast of French Guiana, South America, about 30 miles northwest of Cayenne (Map: Guiana, French, G 2). It became famous through the confinement there of Capt. Alfred Dreyfus (q.v.). Near Devil's Island are the two small French penal islands of Saint-Joseph and Ile Royale, which were formerly known, with Devil's Island, as *Iles du Diable*, but which later received the name Iles du Salut.

DEVIL'S LAKE. A city and county-seat of Ramsey County, N. Dak., 89 miles west by north of Grand Forks, on the Great Northern and the Farmers' Grain and Shipping Company railroads, and on Devil's Lake (Map: North Dakota, G 1). The chief industries are creameries and grist mills. Population, 1900, 1729; 1905, 2367.

DEVIL'S PARLIAMENT. The name given to an English Parliament convened and packed by Henry VI., which met at Coventry in 1459, and unjustly attainted the Duke of York and his adherents of high treason.

DEVIL'S RIDING-HORSE. See Pirate-Bug.

DEVIL'S THOUGHTS, or **DEVIL'S WALK,** The. A short doggerel of fourteen stanzas, written in collaboration by Southey and Coleridge (1799), republished in Coleridge's *Sibylline Leaves* (1817), and in Southey's poems with additional verses referring to Porson.

DEVIL'S WALL. The popular name for the Pfahlgraben, the old Roman wall between England and Scotland, because of its strength.

DEVIL UPON TWO STICKS, The. (1) An English adaptation by Foote of Le Sage's *Le Diable Boiteux*. It was first presented May 30, 1768, the author himself playing the principal part. (2) An imitation of the same original, by William Coombe (1790).

DEVIL-WORSHIPERS. Specifically, a sect called Yezidis, living in Asiatic Turkey and Armenia, and claiming several hundred thousand adherents. Their religion is a survival of primitive worship of the evil mysteries, the essential feature of all savage and barbaric beliefs, though the chief object of their devotion is borrowed from the Old Testament and the Koran. They practice circumcision and baptism.

DEVINE, dė-vīn′, Edward Thomas (1867—). An American director of charitable work, born at Union, Iowa. He graduated in 1887 at Cornell College (Iowa), and from 1894 to 1896 was secretary of the American Society for the Extension of University Teaching. In 1896 he was appointed general secretary of the Charity Organization Society of New York. From April to August, 1906, he was in charge of the relief work of the American National Red Cross, among the sufferers from the San Francisco earthquake. He wrote: *Economics* (1898); *The Practice of Charity* (1901); *Principles of Relief* (1904).

DE VINNE, dė vĭn′nė, Theodore Low (1828—). An American printer, born at Stamford, Conn. He learned the printing trade in the office of the Newburgh (N. Y.) *Gazette*, entered the establishment of Francis Hart in New York City, and was a junior partner in the business from 1859 to 1877. The firm name having been altered in 1883 to Theodore L. De Vinne & Co., he removed in 1886 to a building designed by him, on Lafayette Place. He began to print the *Saint Nicholas Magazine* when it was founded in 1873, and the *Century Magazine* in 1874. He founded the Typothetæ Society, and was elected its president in 1896. His work has done much for the improvement of American typography, both by a high standard of press-work, and by such volumes as *The Invention of Printing* (1876), *Historic Printing Types* (1886), *Plain Types* (1890), *Correct Composition* (1901), *Title-Pages* (1902), *Modern Methods of Book Composition* (1904).

DEVISE (same as *device;* OF., Fr. *devise*, from ML. *divisa*, judgment, contrivance, will). Strictly speaking, a testamentary gift of real property. As a verb, the term is frequently, though improperly, employed interchangeably with *bequeath* (properly, to make a legacy, or testamentary gift of personal property), as signifying any disposition of real or personal property by will. The person making the devise is known as the *devisor*, or, more generally, the testator; the person to whom the devise is made is called the *devisee*. The power to dispose of one's estate by last will and testament is fully recognized in all systems of law of which we have any record, but the peculiar conditions, due to the feudal system, under which our land law developed created a curious exception to this general rule in the case of freehold estates in land. While the common law fully recognized the right of testament, as applied to personal property of all kinds, including leasehold interests in land, it did not admit the corresponding right of disposing by will of freehold interests.

The invention of the system of uses, whereby lands were conveyed on a passive trust to one man 'to the use' and for the benefit of another, opened the door to an evasion of this feudal restriction. The right of the beneficiary of such a trust, called the *cestui que use*, not being a legal estate and so not cognizable by the courts of common law, was protected by the Chancellor as a conscientious claim against the nominal trustee, in whom the bare legal title to the land was vested. The *cestui que use* was thus, by the grace of the Chancellor, permitted to make dispositions of his beneficial interest, as it was termed, which were denied by the common law to the legal tenant of freehold lands, and among them to make death-bed or testamentary dispositions thereof. See Trust; Use.

This practice of devising the use of lands became so common that, upon the abolition of such equitable interests by the Statute of Uses (27 Hen. VIII. c. 10) in 1535, the demand for a convenient and legalized method of disposing of freehold interests in land by testament became irresistible, and resulted five years later in the passing of the first Statute of Wills (32 Hen. VIII. c. 1). This statute was the origin of devises of lands, as we understand the term, and granted "full and free liberty, power, and authority" to dispose by last will and testament in writing of all lands, tenements, and hereditaments, saving only one-third of all lands held by the tenure of knight's service. This restriction was removed by subsequent legislation, and in 1837 a comprehensive statute, the present Wills Act (7 Wm. IV. and 1 Vict. c. 26), was enacted, by which all devises of lands in England have since been regulated.

The earliest American statutes were modeled upon the statute of 32 Hen. VIII., excepting the restriction upon the devising of lands held by knight's service, which, as that tenure never existed on this side of the Atlantic, had no application in this country. Everywhere in the United States freehold interests in lands may now be devised by last will and testament in substantially the same manner as personal property, the matter being regulated by statutes of the several States. See Will.

Notwithstanding the general assimilation of the process of disposing of lands to that of bequeathing personal property by will, devises retain many of the distinctive characteristics impressed upon them by their origin and early history in chancery. They are subject to peculiar rules of interpretation and they have, under the title of executory devises, contributed a large and important body of doctrine to the law of future estates. See Executory Devise; Future Estate; and the authorities referred to under those titles.

DEVIZES, dė-vī′zez. A municipal borough and market-town of Wiltshire, England, near the Avon and Kennet Canal, 22 miles north-northwest of Salisbury (Map: England, E 5). It has two ancient Norman churches and a spacious corn exchange, the town being an important grain market. There are also manufactures of snuff and malt. The town owns its gas and water supply. Population, in 1901, 6500. Roman household gods and coins have been found here. The name of the town is supposed to have been derived from *Divisæ*, signifying the boundary between three parishes. Its first charter was granted by Queen Matilda when it was called *De Vies*. It grew up around a castle built by Roger, Bishop of Salisbury, in the time of Henry I. This castle was repeatedly captured during the wars of Stephen and Matilda and taken by Cromwell in 1645. From the time of Henry VIII. till about 1820, Devizes was the seat of extensive cloth manufactures.

DEVO′NIAN SYSTEM. A division of geology, next above the Silurian and below the Carboniferous; so called because it was first described from Devon, England. The name was suggested by Murchison and Sedgwick to replace that of Old Red Sandstone. It is sometimes called 'Age of Fishes,' owing to the predominance of these vertebrates. The passage from the Silurian into the Devonian is so gradual that the exact boundary between the two is somewhat doubtful. Between the Devonian and Carboniferous there is a somewhat variable relation. In most parts of North America the two formations are practically continuous, but in parts of New England and the Acadian provinces there is a marked unconformity due to an upturning of the beds at the end of the Devonian. There is also some indication in parts of Europe of a similar unconformity. The American section of the Devonian as worked out in the classic New York section is as follows:

Upper	Chemung series	Chemung stage	Shales and sandstones
		Portage stage	
Middle	Hamilton series	Genesee	Shales and sandstones,
		Hamilton	
		Marcellus	Shale.
Early	Corniferous series	Corniferous (limestone).	
		Schoharie (grit and limestone)	
	Oriskany series	Oriskany (sandstone).	

DIVISIONS OF THE DEVONIAN SYSTEM. At the beginning of the Devonian period the dry land of North America was confined to the present territory of eastern Canada and New England. The Alleghany Mountains were sketched in a series of islands and coral reefs which made a barrier between the ocean and the inland sea. There were no large rivers; the valleys of the Hudson, the Connecticut, and the Saint Lawrence were merely outlined, and the Ottawa had begun its work in the Archæan region between the Saint Lawrence and Labrador. The Devonian period was characterized by a series of oscillations of level, the amplitude of the variations, and the subsequent thicknesses of deposit being greater in the eastern part. The inland sea opened south into the Gulf of Mexico, north into the Arctic Sea, and covered all the northern central region of the present continent with shallow lagoons, separated by low, sandy areas.

The distribution of the several divisions is as follows:

(1) The Oriskany sandstone extends from near Oriskany, Oneida County, N. Y., southwest along the Appalachians into Pennsylvania, Maryland, and Virginia. It appears near Buffalo, in Canada, near Waterloo, in Ohio, in Indiana, southern Illinois, and Missouri. Its thickness at Oriskany is about 30 feet; in Illinois, 250 to 300 feet. Its rocks are mostly sandstone, but there are strata of limestone in the Hudson Valley, and in the region west and north of Moosehead Lake.

(2) The Corniferous series, of which the lower member, the Schoharie stage, includes the cauda-galli grit and the Schoharie grit. The former is an argillaceous limestone, occurring in the Helderberg Mountains of eastern New York, and takes its name from a characteristic fossil sea-weed of feathery form. The Schoharie grit is similar in character and distribution, but differs in its fossils, which are very numerous. The upper member of the Corniferous is divided into the Onondaga limestone and the corniferous limestone, the latter taking its name from the presence of much imperfect flint or horn-stone. The corniferous limestones occur in New York, in Ohio along Lake Erie, and throughout the Mississippi basin from Michigan to Kentucky, and from Ohio to Missouri. Its greatest thickness, in Michigan, is 354 feet. Its notable fossil plants are lycopods, conifers, and tree-ferns. This period was the coral-reef period of Paleozoic times, and corals are found in great number and variety. The falls of the Ohio, at Louisville, are caused by such an ancient reef, and are rich in coral fossils.

(3) The Hamilton series includes the Marcellus shales, the Hamilton beds, and the Genesee shales. This formation extends across New York, its greatest thickness, 1500 feet, being east of the centre of the State. It occurs southwardly to Tennessee, and westwardly to Iowa and Missouri; also in the valley of the Mackenzie, so that Meek believed that Devonian rocks are continuous from Illinois to the Arctic Ocean, a distance of 2500 miles.

(4) The stages of the Chemung series are the Portage and the Chemung. The rocks of the lower, or Portage group, appear in western New York, having a thickness of 1000 feet on the Genesee, and 1400 feet on Lake Erie. The Chemung rocks extend over the southern counties of the State, being about 1500 feet thick near Cayuga Lake. Farther south in Pennsylvania and beyond, they become 3000 feet thick. Ripple marks, mud marks, and sun-cracked mud abound, indicating shallow seas, and lands alternately under and above water. The eastward extension of the upper Devonian rocks consists of sandstones and conglomerates, and were formerly considered a separate epoch, called 'Catskill.' They are now thought to be the shore deposits of the Portage and Chemung strata.

The life of the Devonian was abundant, but chiefly marine. Sea-plants, such as fucoids, continued up from the Silurian, and land-plants appeared, including ferns, lycopods, conifers, and equisetæ, many of them being of large size. Some, indeed, are so well preserved that the cellular structure of the wood is observable in their sections. Among the animals great variety abounded. Crinoids of the blastoid or bud-like type, also the plumose ones; brachiopods were not lacking, especially the long-winged species; there were also the early forms of ammonites, trilobites, and insects. An important development is the first appearance of vertebrates—fishes, which fairly swarmed in the Devonian seas. They include relics of sharks, cestraciont, and hybodont; of ganoids, whose modern representative is the gar-pike, having the body covered with shining plates of mail, and of placoderms, having the body covered with bony plates, such as are worn by the turtle-fishes which seem to have linked the ganoids with the sharks. Among the genera were Cephalaspis (q.v.), Pterichthys (q.v.), Coccosteus (q.v.), Dinichthys (q.v.). The latter, found in the Ohio Devonian, was at least 18 feet long; another, Titanichthys, probably reached 30 feet. Both were covered with heavy plates.

The Devonian rocks are of vast importance, economically, for they contain the great stores of petroleum and natural gas obtained in Pennsylvania, New York, West Virginia, and other Appalachian States. The Hamilton beds contain flagging stones of superior quality, while the Corniferous yields lime and cement materials.

In Great Britain the Devonian system includes sandstones, slates, and limestones similar in general character to those appearing in America. The 'Old Red Sandstone,' a fresh-water phase of the Devonian in Scotland, admirably described by Hugh Miller, is the British equivalent of the Catskill series. A large area of Devonian rocks is found in northern France, Belgium, and North Germany, also in Russia, China, and Australia.

Bibliography. Dana, *Manual of Geology* (4th ed., New York, 1896); Geikie, *Text-Book of Geology* (London, 1893); Williams, "The Devonian and Carboniferous," *Bulletin* 80, *United States Geological Survey* (Washington, 1891).

DEV'ONPORT (before 1824 called Plymouth Dock). A municipal borough, maritime and fortified town, and naval arsenal of Devonshire, England, situated on a promontory between Stonehousepool and the Hamoaze or estuary of the Tamar, two miles west-northwest of Plymouth (Map: England, B 6). It stands on high ground, with ramparts defended by batteries. The streets are regularly laid out and well paved, and there are a number of handsome public buildings. The town was incorporated in 1837, although its existence dates from the establishment of a dockyard there in 1689 by William III. It sends two members to Parliament. The town maintains bath-houses, a fine park, a technical school, and a public library. It is a very important military and naval station, being the seat of the military and naval government of 'The Three Towns,' that is, Devonport, Stonehouse, and Plymouth. Its dockyard and naval arsenal are among the most important establishments of this kind in the United Kingdom. The dockyard, together with the Keyham Steam Yard farther up the Hamoaze, with which it communicates by a tunnel, covers an area of some 200 acres. There are also barracks, both naval and military, and a large military hospital. Mount Wise is a fine parade ground, and contains the residences of the Lieutenant-Governor and the Port Admiral. Devonport has important steamship communications. Population, in 1891, 56,000; in 1901, 69,700; in 1905 (estimated), 76,864.

DEV'ONSHIRE (AS. *Defena scir*, shire of the Defons). A maritime county, in the southwest peninsula of England, between the Bristol and English channels (Map: England, C 6). Its area is 2598 square miles, three-fourths being in pasture or arable. The north coast, 60 miles long, is steep and rocky, the chief indentation being Bideford Bay. The south coast, 100 miles long, is also lined with cliffs, and is indented by Tor Bay and Plymouth Sound. The general surface is hilly. It is an important agricultural and dairy county, and has considerable mining, manufacturing, and fishing industries. The chief towns are Exeter (the county town), Plymouth, and Barnstaple. Population, in 1891, 442,287; in 1901, 436,938.

DEVONSHIRE, Spencer Compton Cavendish, eighth Duke of (1833—). An English statesman, long and familiarly known as the Marquis of Hartington. He was the eldest son of William, the seventh Duke, and was born in London, July 23, 1833. He graduated at Trinity College, Cambridge, 1854; was attached to Earl Granville's special mission to Russia, 1856, and entered Parliament as a Liberal, 1857. In 1859 he moved the vote of want of confidence that resulted in the fall of the Derby Ministry. He became Lord of the Admiralty and Under-Secretary of War in 1863, and was Secretary of War for a brief period in 1866. He held the office of Postmaster-General in Mr. Gladstone's Cabinet, 1868-71, resigning in the latter year to become Chief Secretary for Ireland. In 1875 he succeeded Mr. Gladstone as the leader of the opposition in Parliament, and on the downfall of the Conservative Administration, 1880, was sent for by the Queen to form the new Cabinet; this task being declined both by him and by Lord Granville, it finally devolved upon Mr. Gladstone. In the new Cabinet Lord Hartington was first Secretary of State for India and then Secretary of State for War (1883-85), during which period occurred Lord Wolseley's memorable expedition to relieve General Gordon (q.v.) at Khartum. Opposed to Mr. Gladstone's Home Rule policy, in 1886 he became the acknowledged leader of the Liberal Unionists (q.v.), and subsequently gave a vigorous support to Lord Salisbury's Administration. He became eighth Duke of Devonshire in 1891, and the following year married the Dowager Duchess of Manchester, widow of the seventh Duke. The same year he received the Order of the Garter. From 1895 to 1903 he was Lord President of the Council, and from 1900 to 1902 president of the new Board of Education. He retired from the ministry in 1903 as a protest against the protectionist views advocated by Mr. Joseph Chamberlain, and became president of the Unionist Free Food League. He received the academic honors of the lord rectorship of Glasgow University, 1877, lord rectorship of Edinburgh University, 1879-91, the chancellorship of Cambridge University, 1892, and presidency of Owen's College, Manchester, 1900.

DEVONSHIRE CLUB. A Liberal club, founded in 1875, on Saint James Street, London.

DEVONSHIRE HOUSE. The London residence of the Duke of Devonshire, in Piccadilly, near Berkeley Square. It contains fine collections of portraits, gems, and the 'Kemble Plays,' including the first editions of Shakespeare.

DE VRIENDT, d*e* vrēnt. See Floris, François.

DEVRIENT, d*e*-vryäN', Gustav Emil (1803-72). One of a distinguished German family of actors, he and his elder brothers, Karl August (1797-1872) and Philipp Eduard (q.v.), being nephews of Ludwig Devrient (q.v.). Emil Devrient, as he is known, was born September 4, 1803, in Dresden, and began life in a manufacturing business, but, having the family preference for the theatre, made his début as an actor and singer in Brunswick in 1821. In 1825, in Leipzig, whither he had come about two years before from Bremen, he married Dorothea Böhler, a popular actress. After playing also in Magdeburg (1828) and Hamburg (1829), he, in 1831, began his connection with the Court Theatre of Dresden, where he spent most of the remainder of his life. He died August 7, 1872. He was an artist of great ability, excelling notably in the use of his voice. Among his greatest rôles were Hamlet, Posa, Tasso, and Uriel Acosta.

DEVRIENT, Ludwig (1784-1832). A celebrated German actor, first of the noted theatrical family of this name. He was born December 15, 1784, in Berlin, the son of a silk-merchant, and had begun the commercial career that his father planned for him, when, in 1804, he joined a traveling dramatic company. He made his début in Gera, as the messenger in the *Bride of Mes-*

sina. The next year he secured an engagement in Dessau, and in 1809 he went to Breslau. In 1815, having made the acquaintance of Iffland (q.v.), he appeared for the first time on the stage in Berlin, as Franz Moor in Schiller's *Räuber.* He won distinction also in the rôles of Talbot, Schewa, Lorenz Kindlein, the Moor in *Fiesco,* and the Shakespearean parts of Shylock, Lear, Richard III., and Mercutio. His acting was characterized by great originality and he excelled alike in pathos and humor. His power was due more, it is said, to his natural gifts than to study. His habits of life were dissipated, and his premature death, which occurred in Berlin, December 30, 1832, was hastened by the use of stimulants.

DEVRIENT, OTTO (1838-94). A German actor and dramatist, son of Philipp Eduard Devrient (q.v.). He was born October 3, 1838, in Berlin, and made his début on the stage in Karlsruhe in 1856. He had engagements in Stuttgart, Berlin, and Leipzig; then returned to Karlsruhe in 1863 and remained till 1873, after which he was manager successively of theatres in Weimar, Mannheim, and Frankfort. In 1879 he retired to Jena, and there produced his *Luther,* a play written on the occasion of the Luther jubilee in 1883. The next year he became director of the Court Theatre in Oldenburg, and in 1889 was called to a similar position in Berlin, from which he retired in 1890. He died June 23, 1894. He is the author of several dramas, among them *Zwei Könige* (1867); *Tiberius Gracchus* (1871); and *Was wir bieten* (1873); and other works, including *Zwei Shakespeare-Vorträge* (1869); and an edition of letters of Iffland and Schröder (1881).

DEVRIENT, PHILIPP EDUARD (1801-77). A German actor and dramatist, brother of Karl August and Gustav Emil Devrient (q.v.). He made his début as an opera singer in Berlin when eighteen years old, but after 1835 devoted himself to the drama, and was manager for a time of the Dresden Theatre. From 1852 to 1870 he directed that of Karlsruhe. He wrote a number of dramatic pieces, among them the libretto for the opera *Hans Heiling* (1827), and the plays *Das graue Männlein* (1833), *Die Verirrungen* (1837), and *Treue Liebe* (1841); and also several historical and critical works upon the drama, notably his *Geschichte der deutschen Schauspielkunst* (1848-74).

DE VRIES, de vrēs, DAVID PIETERSZEN. A Dutch colonist. Nothing is known of his early history except that he served for a time as master artilleryman in the Dutch Army. He was a member of an association or company which was organized in 1630 for the purpose of settling the tract of land in the present State of Delaware bought from the Dutch West India Company by Samuel Blommaert and Samuel Godyn in the previous year. A small settlement was made early in 1631, on Lewes Creek, just within Cape Henlopen, and the surrounding country was christened Swaanendael. In a few months, however, the colony was destroyed by the Indians, and De Vries, who had been chosen governor or director, found on his arrival (1632), says Bancroft, "only the ruins of the house and its palisades, half consumed by fire, and here and there the bones of colonists." He left a portion of his party there, while he himself spent some time in Virginia; but concluding that the colony would never be a commercial success, he carried the colonists back to Holland in 1634. He visited Manhattan several times thereafter; attempted to establish a patroonship on Staten Island, where in 1640 his settlement was destroyed by the Indians; and for some time lived on a plantation, Vriessendael, about 25 miles north of New Amsterdam, on the site of the present Tappan, N. Y. He published a volume entitled *Korte historiaal ende Journaels Aenteyckeninge van verscheyden Voyagien in der vier Teelen des Wereldts Ronde* (1655) (*A Short History and Notes of a Journal Kept During Several Voyages in the Four Quarters of the World*), which contains a valuable account of conditions in New Netherland during the administration of Van Twiller and Kieft. The parts of it relating to America have been translated into English, and may be found in vols. i. and iii., second series, of the *Collections of the New York Historical Society.*

DEW (AS. *dēaw,* Ger. *Thau;* cf. Skt. *dhav, dhāv,* to flow). Dew is said to be formed when atmospheric moisture is condensed by cold into drops of water upon grass, trees, rocks, roofs of buildings, or other solid surfaces, while the adjacent air remains clear. The moisture which gathers on the outside of a vessel containing cold water is also termed dew. A thermometer placed in the cold water within this vessel so as to give the temperature of the external surface on which the dew is deposited, indicates the so-called temperature of the dew-point, or the temperature to which the free air must be cooled in order to begin depositing dew, and this combination of thermometer and vessel is a *dew-point apparatus.* Many forms of such apparatus have been devised in order to obtain the highest accuracy in the determination of this important meteorological datum and are described in Abbe's *Meteorological Apparatus and Methods* (Washington, 1888). The apparatus usually preferred is that of Regnault, which, with occasional slight modifications, is used in all fundamental determinations of atmospheric moisture. This apparatus consists essentially of a very sensitive thermometer, whose bulb dips into a thimble of polished gold or silver, while the upper end of the graduated stem protrudes beyond this thimble. If the thimble is filled with ether and a current of air blown through it in order to evaporate the ether, the latter soon cools down to the dew-point. When this is reached a slight deposit of dew is seen on the outside of the polished thimble. At this moment the reading of the thermometer is to be noted, and as the temperature of the ether has probably already fallen below the dew-point, one waits a minute until the dew on the polished tube evaporates and disappears, when another reading of the thermometer is made. The mean of these two readings should give the temperature of the dew-point to within a tenth of a degree.

When dew is thus deposited it indicates that the air from which the moisture comes has been cooled to what is known as the point of saturation and all the vapor associated with the air can no longer remain as vapor. This cooling process takes place naturally every clear night, so that in the course of the early morning not only are the grass and other exposed objects often covered with dew, but the quiet layers of the air near the ground begin to condense their moisture in the shape of fog. The deposition of dew, and especially the formation of fog, retards the cooling of leaves and other objects near the ground and delays the occurrence of freezing temperatures and frosts. The actual quantity of dew accumulating on the leaves and dripping to the ground, so as to become available for the use of the roots of the plants, is in cloudless regions, such as Arizona, California, Syria, and Arabia, so large as to be an important matter in agriculture. Many attempts have been made to devise apparatus for measuring the absolute quantity of dew per unit of area of surface, but these drosometers (q.v.) almost necessarily employ as the collecting surface something different from the natural leaves, grass, and stones, and their measurements are at best not absolutely, but only relatively representative of the natural phenomenon.

The discovery of the true explanation of the formation of dew is commonly ascribed to Dr. W. C. Wells, of Charleston, S. C., and London, Eng., who published his *Essay on Dew* in 1814, but is equally due to Musschenbroek, Peclet, Wilson, and others. The air that lies near the surface of the ground receives its moisture to a considerable extent from the soil beneath it, and therefore only a small part of the dew comes from a great distance. The ground is perpetually either absorbing or giving out moisture, and the nearer the bedewed surface is to the ground the more of this fresh moisture it will contain, so that the idea that dew falls from above, whence its Spanish name, *serena*, and its French name, *serein*, is not correct, as was shown by Musschenbroek and Wells, and very recently restated by Stockbridge. The formation of dew and fog in the night can only take place when (and therefore indicates that) the sky is sufficiently cloudless to allow of almost uninterrupted radiation of heat. Consequently when any object is covered by even the slightest screen, no dew is found on it.

If the dew-point is below the temperature of freezing, then, instead of dew, we have a formation of frost. When the wind is blowing, dew is not formed in dry weather, because the wind brings a supply of relatively warm, dry air to the cooling surfaces of the leaves and warms them up, by conduction, enough to prevent them from cooling to the dew-point. But in moist insular climates dew may form for a while before fog prevails.

When the air is exceedingly dry the process of radiation (counteracted, as it always is, in part by the conduction and convection of heat) may not be sufficiently intense or proceed far enough to cool ordinary surfaces down to the dew-point: temperatures will, of course, steadily fall during the night, but the sun may rise and warm up the ground before dew is formed. This can occur only in dry air, namely, that in which the dew-point is very low. Under the most favorable conditions in the dry climate of Arizona the temperature at the surface may thus be lowered in the course of a night by as much as twenty, thirty, or forty degrees, when the depression of the dew-point below the temperature of the dry air is still greater, so that on such a night no dew is recorded.

The number of degrees by which the dew-point is lower than the temperature of the air is known as the *complement of the dew-point*. In addition to the dew-point apparatus there are other indirect methods of determining the dew-point, which are less exact, but frequently more convenient. The apparatus most commonly used in such cases is the so-called dry and wet bulb thermometer, or psychrometer, which will be found described under HYGROMETER.

For many details with regard to dew and cognate phenomena consult the works of Charles Tomlinson, especially *The Dewdrop and the Mist* (London, 1860), and his historical article in the *Edinburgh New Philosophical Journal*, vol. xiii. (Edinburgh, 1861).

DEW, THOMAS RODERICK (1802-46). An American educator and writer. He was born in King and Queen County, Va., and graduated in 1820 at William and Mary College, where he was professor of history, metaphysics, and political economy from 1827 to 1836, and served as president from 1836 until his death. In 1832 he published a review of the celebrated debate of 1831-32 over slavery in the Virginia Legislature, under the title *An Essay in Favor of Slavery*, which went far toward putting a stop to a movement, then assuming considerable proportions, to proclaim emancipation in Virginia. His most important work is a *Digest of the Laws, Customs, Manners, and Institutions of Ancient and Modern Nations* (1853).

DEWALQUE, de-välk′, GILLES JOSEPH GUSTAVE (1826—). A Belgian geologist, born at Stavelot. He became curator of the mineralogical and geological cabinet at the University of Liège in 1855, and professor there of mineralogy, geology, and paleontology in 1857. In 1870 he was elected president of the Belgian Academy. In addition to a considerable number of contributions to scientific periodicals, he has published a *Description du Lias dans le Luxembourg* (1857); an *Atlas de cristallographie* (1860); *Prodrome d'une description géologique de la Belgique* (2d ed. 1874); and other works.

DEWAR, JAMES (1842—). A British chemist, born at Kincardine-on-Forth, Scotland. He was educated at Edinburgh University, and was assistant there to Lord Playfair when he occupied the chair of chemistry. Subsequently he became Jacksonian professor of experimental philosophy at Cambridge, and Fullerian professor of chemistry in the Royal Institution. In 1897 he was elected president of the Chemical Society, and in 1902 of the British Association. His scientific researches include studies in regard to the physiological action of light and the liquefaction of gases, and in particular investigations of low temperatures. By means of the evaporation of liquid hydrogen under a reduced atmospheric pressure he obtained the lowest temperature yet reached—256° C. (—429° F.). With Sir Frederick Abel (q.v.) he invented cordite, a smokeless gunpowder used by the British Government.

DEW′ART, EDWARD HARTLEY (1828—). A Canadian clergyman and author, born in County Cavan, Ireland. He was educated in Toronto, Canada, and was called to the Wesleyan Methodist ministry in 1851. He edited (1869-94) the *Christian Guardian*, the chief organ of his Church in Canada, and published, besides other works, *Songs of Life* and *Selections from the Canadian Poets*.

DEWBERRY (from *dew* + *berry*, apparently as being a trailing plant), *Rubus Canadensis* or *Rubus villosus*. A representative of the blackberry tribe, familiarly known as running brier, and recognized as a common weed of worn-out or neglected fields and waste places. It is also known as the running blackberry. There are several species of Rubus which have a decumbent habit, but the above is the only one which has given a cultural product of merit. The cultivation of this form of blackberry began with the discovery and introduction of the Lucretia, a large-fruited and strong-growing form which has given good returns under skillful management. It is usually planted 3 × 6 feet apart, given clean culture, and the vines tied to stakes or provided with a rack or trellis. It propagates readily by layers. Hybrids between the blackberry and dewberry are in cultivation, and are not uncommon in nature. See also RUBUS.

DEWD'NEY, EDGAR (1835—). A Canadian statesman. He was born in Devonshire, England, and was educated as a civil engineer. In 1859 he went to British Columbia, became a member of the local Parliament in 1868, and from 1872 to 1879 was a member of the Dominion Parliament. He was then Indian Commissioner until 1881, when he became Lieutenant-Governor of the Northwest Territory. In 1888 he was appointed Minister of Interior and ex-officio Superintendent of Indian Affairs for Canada, and in 1892 became Lieutenant-Governor of British Columbia.

DEWEES', WILLIAM POTTS (1768-1841). An American physician, well known as a specialist in obstetrics. From 1826 to 1834 he was professor of the diseases of women and children in the University of Pennsylvania. Among his publications are: *System of Midwifery* (12th ed. 1854); *Treatise on the Physical and Medical Treatment of Children* (1825; 10th ed. 1854); *Treatise on the Diseases of Females* (1826; 10th ed. 1854); and *Practice of Medicine* (1830).

D'EWES, dūz, Sir SIMONDS (1602-50). An industrious English chronicler and antiquarian. He was the son of Paul D'Ewes, of Milden, Suffolk, one of the six clerks of chancery, and was born at Coxden, Dorsetshire, on December 18, 1602. His preparatory education was gained under several private teachers. Through Henry Reynolds, of Saint Mary Axe Parish, London, he became strongly indoctrinated with the Puritan theology, and to John Dickinson, upper master of Bury School, he owed his first enthusiasm for scholarly research. In 1618 he entered Saint John's College, Cambridge; but two years later, before taking a degree, he was removed by his father to the Inner Temple, where he was called to the bar in 1623. He abandoned the law three years later, partly in consequence of his marriage with the rich heiress of Sir William Clopton, of Lutons Hall, Suffolk. In the same year he was knighted. He now began to devote himself zealously to those antiquarian studies which he never abandoned, although he represented Sudbury in the Long Parliament and was one of the members expelled by Pride's Purge in 1648. He wrote and collected a vast number of manuscripts, and made many transcripts from monastic and other records, and these now form a part of the Harleian Collection preserved in the British Museum. His greatest work is the *Journal of All the Parliaments of the Reign of Queen Elizabeth*, finished in 1629, but first edited and published by his nephew, Paul Bower (London, 1682). This work was incorporated by Cobbett in his *Parliamentary History*. Consult: Jessopp, in the *Dictionary of National Biography*, xiv. (London, 1888), and Halliwell-Phillipps's edition of the *Autobiography and Correspondence of Sir Simonds D'Ewes During the Reign of James I. and Charles I.* (London, 1845).

DE WET, de vĕt', CHRISTIAN (c.1853—). A distinguished Boer commander. He won a name for gallantry in the war between the Transvaal and the British in 1880-81, and became famous for his skill in hunting. During the latter stages of the Boer War of 1899-1902 he proved a formidable adversary to the British, who for a time made him their principal objective. Frequently he would appear to be completely enmeshed in a girdle of block-houses, wire entanglements and fences, and pursuing columns; but as often, through the exercise of a clever ruse, completely evaded his pursuers and inflicted damage on some British convoy or outpost in the most unexpected direction. On February 6, 1902, his capture between Lindley and Kroonstad, by the British columns under Lord Kitchener, seemed certain. He was driven into a corner from which escape was rendered difficult by strong wire fences and entanglements; but, to the consternation of his pursuers, he hurled a large drove of cattle, goaded almost to madness, against the wire obstacles, and in the confusion made his escape. In common with other Boer leaders, he made submission to Lord Kitchener, and afterwards served on a Boer committee to raise funds in Europe and America for the distressed Boer families. During the war he never wore the slightest badge of rank, and he was always taciturn to a degree. He had the complete confidence of his soldiers, but, in common with all the other Boer leaders, suffered the defeat of his best schemes because of the individuality and independence of the burghers under his command. He was regarded by the British Government as one of the most influential of the Boer leaders, and great satisfaction was evinced at the dignified manner of his acceptance of the inevitable. He wrote *Three Years' War* (New York, 1902).

DE WETTE, de wĕt'te, *or* vĕt'e, WILHELM MARTIN LEBERECHT (1780-1849). A German theologian. He was born at Ulla, near Weimar, and studied at the University of Jena. In 1807 he was appointed extraordinary professor of philosophy at Heidelberg, in 1809 professor of theology, and in 1810 was called to Berlin. By his excellence as a teacher, as also by his writings, De Wette soon acquired a great reputation. In 1819, on account of a letter which he wrote addressed to the mother of the assassin of Kotzebue, he was deprived of his chair. In 1822 he was appointed professor of theology in the University of Basel, where his prelections and sermons in a short time secured him universal esteem and applause. In 1829 the Grand Council of Basel made him a member of the Council of Education, and granted him the freedom of the city. In 1849 he was elected rector of the university, but died the same year. De Wette was a man of comprehensive learning and acute philosophic discernment. His antipathy to the shackles of dogmatic theology gave keenness and vigor to his criticism. A temperate but very decided historical rationalism, on a broad basis of moral reverence, would perhaps best express his biblical standpoint. His principal works are: *Beiträge zur Einleitung in das alte Testament* (1806-7); *Commentar über die Psalmen* (1811); *Lehrbuch der historisch-kritischen Einleitung in die Bibel, alten und neuen Testaments* (1817-26), English trans. of Old Testament part by Theodore Parker (1843); *Lehrbuch der christlichen Dogmatik* (1813-16); *Christliche Sittenlehre* (English trans. by Samuel Osgood, 1842); *Theodor* (1828), English trans. by James Freeman Clarke (1849); *Vorlesungen über die Religion, ihr Wesen, und ihre Erscheinungsformen* (1827); *Das Wesen des christlichen Glaubens* (1846); *Exegetisches Handbuch zum neuen Testament* (1845-65). With J. C. W. Augusti he made a German translation of the entire Bible (Heidelberg, 1809-11, 5 parts; 4th ed., 1858, 3 vols.). Besides these, De Wette published a critical edition of the correspondence of Luther (Berlin, 1825-28). For his life, consult A. F. J. Wiegand (Erfurt, 1879).

DEW'EY, Charles Melville (1849—). An American landscape painter. He was born at Lowville, N. Y. He studied at Paris in the winters of 1876 and 1877. His work is full of sentiment and generally depicts subdued morning and evening effects. His works include "Indian Summer," and "A November Evening," 1904; "Morning Bay of Saint Ives," "The House in the Fields," and "The Brook," 1905. He became an associate of the National Academy of Design.

DEWEY, Chester (1784-1867). An American scientist. He was born in Sheffield, Mass.; graduated at Williams College in 1806, and was professor of mathematics and natural philosophy there from 1810 to 1827. From 1850 until 1860 he was professor of chemistry and natural philosophy in the University of Rochester. Dr. Dewey made many contributions to science.

DEWEY, Davis Rich (1858—). An American political economist and statistician, born at Burlington, Vt., and educated at the University of Vermont and the Johns Hopkins University. He became professor of economics and statistics at the Massachusetts Institute of Technology and secretary of the American Statistical Association, Boston, Mass. He was a member of the commission on public charitable and reformatory institutions in 1897, and of the State board on the question of the unemployed. Among his works are *Reports* published on behalf of these commissions, and *Financial History of the United States* (1902). His *Syllabus on Practical History Since 1815* (1887) is a valuable work of reference.

DEWEY, George (1837—). An American naval officer, born in Montpelier, Vt. He graduated at the United States Naval Academy in 1858, and began active service on the Mediterranean station. In 1862, under Farragut, he was present at the passage of Forts Jackson and Saint Philip on the lower Mississippi, and in 1864-65 participated in the attack on Fort Fisher. He became lieutenant-commander in 1865, commander in 1872, captain in 1884, and commodore in 1896. In 1898, at the outbreak of the war with Spain, he was appointed to the command of the Asiatic station, and on May 1 entirely destroyed the Spanish fleet in Manila Bay, without the loss of a man in his own fleet. In recognition of this achievement he was immediately appointed rear-admiral, and was especially honored by Congress. He aided General Merritt in the capture of the city of Manila (August 13, 1898), and subsequently was a member of the Schurman Philippine Commission. His reception in the United States on his return in 1899 was an enthusiastic ovation. The same year he was made admiral, a rank previously attained by Farragut and Porter only. Admiral Dewey has served on the Lighthouse Board, as chief of the Bureau of Equipment, and as president of the Board of Inspection and Survey. In the months preceding the Presidential campaign of 1900 his name was prominently before the country for a time, but his candidacy, from a political standpoint, was not seriously considered. In 1901 Admiral Dewey served as president of the Schley Court of Inquiry. (See Schley.) He signed the unanimous report delivered by the court to the Secretary of the Navy on December 13, but further submitted a minority report in which he dissented from certain specifications of the principal document.

DEWEY, John (1859—). An American psychologist and philosopher, born in Burlington, Vt. He graduated in 1879 at the University of Vermont, in 1884 at the Johns Hopkins University, and was appointed professor of philosophy at the University of Chicago. He became afterwards professor of philosophy at Columbia University. His publications include: *Outlines of a Critical Theory of Ethics* (1891); *The Significance of the Problem of Knowledge* (1897); *My Pædagogical Creed* (1897); *The School and Society* (1900); *Studies in Logical Theory* (1903).

DEWEY, Melvil (1851—). An American librarian and educator. He was born at Adams Centre, N. Y., and graduated at Amherst College in 1874. In 1876 he published his *Decimal Classification*, and founded the *Library Journal*, the organ of American librarians. He took an active part in founding the American Library Association, of which he was secretary for fifteen years, and twice president. At this period he also edited the *Spelling-Reform Bulletin*, the *Metric Bulletin*, and similar educational publications. In 1883 he became librarian of Columbia College, and in 1884 he established in connection with the library a school of library economy. This was transferred to Albany in 1890, and is known as the State Library School. He was chosen in 1889 secretary and treasurer of the University of the State of New York and director of the New York State Library. In 1899 he resigned as secretary of the university, and in 1905 as State librarian. He prepared cataloguing rules that are widely used; his "decimal classification" has been adopted in most American, and in many foreign libraries.

DEWEY, Orville (1794-1882). An American Unitarian clergyman. He was born in Massachusetts, graduated at Williams College, and later became a divinity student at Andover. He preached in Boston for two years, as assistant to Dr. Channing, forming a friendship which was only broken by death. In 1823 he became pastor of the Unitarian Church in New Bedford. He went to New York in 1835, and while pastor there secured the erection of the Church of the

Messiah. About 1844 he quitted the pulpit and lectured in various parts of the country. Among his works are: *Letters on Revivals; Discourses on Human Nature; Discourses on Human Life* (1841); *Discourses on the Nature of Religion;* and *The Unitarian Belief.* A collected edition of his works appeared in New York (1847). Consult his *Autobiography and Letters,* edited by his daughter (Boston, 1884).

DEW′ING, THOMAS WILMER (1851—). An American figure and portrait painter. He was born in Boston. He studied in Paris from 1876 to 1879. His art is delicate and refined in conception and color, and distinguished in line and arrangement. His works include "The Days" (Clark prize, 1887), "Lady in Yellow" and "Lady in White," "Summer," "The White Carnation," "The Spinet," and "Reading." In 1906 he exhibited "A Lute Player." He became a member of the Society of American Artists, and of the National Academy of Design.

DE WINTER, de vĭn′tẽr, JAN WILLEM (1750-1812). A Dutch admiral. He was born at Kampen, and entered the navy at the age of twelve. He fought in the French ranks under Dumouriez and Pichegru, rising to the rank of brigadier-general. Upon his return to Holland in 1795 he was appointed by Napoleon commander of the Dutch fleet, consisting of fifteen ships of the line and twelve frigates. On October 11, 1797, he was attacked by Admiral Duncan and defeated in the hotly contested battle of the Texel, his own ship, the *Frijheid,* and seven others falling into the hands of the British. Although captured and conveyed as a prisoner of war to England, he was treated there with distinction, and, upon his return to Holland, was not only exonerated from blame, but commended for his gallantry and skill. In 1798 he became Minister Plenipotentiary to France, and in 1802 was reappointed to the command of the Dutch fleet.

DE WITT, de vĭt, CORNELIUS (1623-72). A Dutch naval officer. He was born at Dort, and was educated at Leyden. As an officer under Admiral De Ruyter he participated in the burning of the British shipping in the Medway (1667), and in 1672 took a conspicuous part in the battle of Solebay (Southwold). In this year he was charged by Tichelaar with participation in the plot to murder the Prince of Orange, and, after being tortured, was sentenced to banishment. As he was leaving his prison he was attacked by the burghers of The Hague and murdered, with his brother, Jan De Witt. He was not only an able officer, but a man of broad general culture.

DE WITT, JAN (1625-72). A celebrated statesman of Holland, born at Dort, September 25, 1625. He was the son of Jacob De Witt, a vehement opponent of William II., Prince of Orange. Young De Witt was carefully educated, and soon exhibited remarkable ability. He was one of the deputies sent by the States of Holland in 1652 to Zealand for the purpose of dissuading that province from adopting the cause of Orange. There his eloquence secured him such universal confidence that he was made Grand Pensionary of Holland, an office to which he was several times reëlected. The Orange party, supported by the populace and the clergy, was ever striving to increase the power of the young prince (afterwards William III.), who was then a mere infant; the republican, or oligarchic, party, composed of the nobles and the wealthier burgesses, at the head of which was De Witt, sought, on the other hand, to strip the House of Orange of all power, and to abolish entirely the office of Stadtholder. During William's minority the advantage was with De Witt and the republicans. In 1654, on the conclusion of the war with England, a secret article was inserted in the treaty drawn up between De Witt and Cromwell, in virtue of which the House of Orange was to be deprived of State offices for all time. The accession of Charles II. severed the friendly relations of England, and caused De Witt to lean toward France. A commercial treaty between France and Holland was followed, in 1665, by another English-Dutch war, which lasted until the Peace of Breda, in 1667. The result was that the power of the republican party in Holland seemed firmly established, for in the same year a perpetual edict was proclaimed abolishing forever the office of Stadtholder. But in reality, however, the power of De Witt was diminished, and he was soon compelled to concede a larger measure of influence to the House of Orange. His prospects became still more clouded when the designs of Louis XIV. upon the Spanish Netherlands became manifest. The Orange party carried their point in the elevation of William to the family dignity of Stadtholder. On the invasion of the Netherlands by Louis XIV., in 1672, the Prince of Orange was appointed commander of the Dutch forces; and when the first campaign proved unfortunate, the popular clamor against De Witt greatly increased. He had previously resigned his office of Grand Pensionary, and now his brother Cornelius, accused of conspiring against the life of the Stadtholder, was imprisoned, tortured, and condemned to perpetual banishment. De Witt went to see him on his release from prison, and as they were coming out they were attacked by an infuriated mob and were both murdered, August 20, 1672. The States-General demanded an investigation and the punishment of the murderers, but the Stadtholder did not take the necessary steps. De Witt was personally a man of the most upright character. Consult: Portalis, *Jan De Witt* (English trans., 2 vols., London, 1885); Geddes, *The Administration of John De Witt* (London, 1879); Motley, *History of the United Netherlands* (4 vols., New York, 1860-68).

DE WITT, JOHN (1821—). An American Reformed Dutch scholar. He was born at Albany, N. Y., November 29, 1821; graduated at Rutgers College in 1838, and at New Brunswick Theological Seminary in 1842; was professor of Oriental literature (1863-84) and of New Testament exegesis (1884-91) in the latter institution. He was a member of the Old Testament Company of the American Revision Committee (1872-85), and author of *The Praise Songs of Israel: A New Rendering of the Book of Psalms* (1885).

DE WITT, JOHN (1842—). An American Presbyterian scholar. He was born at Harrisburg, Pa., October 10, 1842; graduated at Princeton College in 1861 and at Union Theological Seminary, New York City, in 1865. He became professor of Church history in Lane Theological Seminary, Cincinnati, Ohio, in 1882, and of the same in Princeton Theological Seminary in 1892.

DEWSBURY, dūz'bẽr-ĭ. A Parliamentary and municipal borough and manufacturing town in the West Riding of Yorkshire, England, on the Calder, eight miles south-southwest of Leeds (Map: England, E 3). Dewsbury is noted for its manufactures of worsted, carpets, blankets, and various kinds of heavy woolen goods. There are collieries and iron-works in the immediate neighborhood. It is on three railway lines and connected by the Calder and its branches with Hull and Liverpool. Among its notable buildings are the town hall, chamber of commerce, infirmary, and grammar school. The town received its charter of incorporation in 1862. It sends one member to Parliament. The town owns its water and gas works, operates its electric-light plant, and maintains public baths, cemeteries, markets, technical schools, and a free library. A modern sewerage system has been installed in connection with a sewage farm. Population, in 1901, 28,000. At Dewsbury, in 627, Paulinus first preached Christianity to the Northumbrians.

DEW-WORM. A British name for the earthworm. See EARTHWORM.

DEXIP'PUS (Lat., from Gk. Δέξιππος). A Greek philosopher, a follower of the Neo-Platonist Iamblichus, belonging to the middle of the fourth century A.D. He wrote commentaries on Plato and Aristotle, of which one, in explanation and defense of the Aristotelian categories, has appeared in both Latin and Greek texts. The former, under the title *Quæstionum in Categorias Libri Tres*, was edited by Félicien (Paris, 1549); the latter by Spengel (Munich, 1859).

DEXIPPUS, PUBLIUS HERENNIUS (?-c.280 A.D.). A Greek rhetorician, historian, and soldier. He was born at Athens, and after holding the highest offices in his native city, commanded the army against the Goths when they invaded Greece and captured Athens in A.D. 262. Photius describes three of his historical works: Τὰ μετὰ 'Αλέξανδρον, a history of Macedonia from the time of Alexander the Great; Σύντομον ἱστορικόν (or χρονικὴ ἱστορία), a chronological history from the earliest times down to the accession of the Emperor Claudius II., A.D. 268; and Σκυθικά, an account of the war against the Scythians or Goths, in which Dexippus himself had fought. Though Photius looks upon Dexippus as a second Thucydides, the extant fragments of his works, which are numerous, show that he had most of the faults of the later Greek rhetoricians. For these fragments, consult: Bekker and Niebuhr, *Scriptores Historiæ Byzantinæ* (Bonn, 1829); and Müller, *Fragmenta Historicorum Græcorum* (Paris, 1868-83). A public statue was erected in his honor, the base of which with its inscription has been preserved.

DEX'TER, HENRY MARTYN (1821-90). An American clergyman and historian. He was born in Plympton, Mass.; graduated at Yale in 1840, and at the Andover Theological Seminary in 1844; and was pastor of a Congregational church at Manchester, N. H., from 1844 to 1849, and of the Berkeley Street Congregational Church in Boston from 1849 until 1867. He edited the *Congregationalist* from 1851 to 1866, the *Congregational Quarterly* from 1859 to 1866, and in 1867 became editor-in-chief of the *Recorder*, in which the *Congregationalist* had been merged. He held a pastorate at Dorchester, Mass., from 1869 to 1871, and from 1877 to 1880 delivered annual courses of lectures on Congregationalism at the Andover Theological Seminary. He wrote several valuable works on the history of the Congregational Church and the ecclesiastical history of New England. Among his publications are: *The Voice of the Bible and the Verdict of Reason* (1858); *Congregationalism: What it is, Whence it is, How it Works, Why it is Better than Any Other Form of Church Government, and its Consequent Demands* (1865), which passed into many editions; *The Church Polity of the Pilgrims the Polity of the New Testament* (1870); *Roger Williams and His Banishment from the Massachusetts Colony* (1876); *The Congregationalism of the Last Three Hundred Years with a Bibliographical Appendix* (of 7250 titles) (1881)—his most valuable work; *A Handbook of Congregationalism* (1880); *The True Story of John Smyth, the Se-Baptist* (1881); *Common Sense as to Woman Suffrage* (1885); *Early English Exiles in Amsterdam* (1890); and with his son, *The England and Holland of the Pilgrims* (1905), posthumous. He also edited *Church's Eastern Expeditions* and *Entertaining Passages Relating to King Philip's War*, and Mourt's *Relation;* and left in MSS. *A Bibliography of the Church Struggle in England During the Sixteenth Century* and the *Pre-History of Plymouth Colony, with the English and Dutch Life of the Plymouth Men.*

DEXTER, SAMUEL (1761-1816). An American jurist. He was born in Boston, graduated at Harvard in 1781, and was admitted to the bar in 1784. He was a member of the State Legislature, and served in Congress both as Representative and Senator. He was appointed Secretary of War in June, 1800, and from December of this year until the inauguration of Jefferson was Secretary of the Treasury. He published a *Letter on Freemasonry; Progress of Science*, a poem (1780); and *Speeches and Political Papers.*

DEXTER, TIMOTHY (1743-1806). An American merchant, born at Malden, Mass. He rose to great affluence, but is memorable chiefly for his eccentricities. Assuming the title of Lord Timothy Dexter, he built extraordinary houses at Newburyport, Mass., and Chester, N. H. The garden of the former he adorned with about forty colossal wooden statues of famous men, including himself. He also maintained a poet-laureate, and formed a collection of paintings composed entirely of daubs. He was the author of *A Pickle for the Knowing Ones.* Having been troubled by his printers in regard to punctuation, he retaliated by writing a pamphlet without a comma or any other point, but displaying at the end half a page of points in a mass, with the invitation to his readers to "pepper tne dish to suit themselves." He also rehearsed his own funeral procession in the most elaborate manner and caned his wife for not weeping at the sight of the cortège.

DEXTRIN (from Lat. *dexter*, right, referring to its power of turning to the right the plane of polarized light). A name applied to several organic substances produced by the action of malt extract, saliva, or pancreatic juice upon starch paste, the first product of the transformation being soluble starch, and dextrin being produced by the hydrolysis of the latter. A continuation of the hydrolytic action results in the formation of sugars. The principal dextrins are: erythro-dextrin, achroödextrin, and maltodextrin, all of which have the same relative composition as starch—$(C_6H_{10}O_5)n$; their molecular weights, however, are unknown. Achroödextrin may be prepared by the prolonged action of saliva or pancreatic juice on starch paste; when the solution ceases to be colored by the addition of iodine, that is to say, when all the starch has been transformed, the solution is concentrated by evaporation and precipitated with alcohol. The substance thus obtained is completely freed from maltose by warming with mercuric cyanide and caustic soda and may be further purified by dissolving in water and reprecipitating with alcohol.

Dextrin (British gum or starch gum) is often used as a substitute for gum arabic in the processes of calico-printing, and for stiffening different goods; it is also applied to the back of postage stamps. Its value as a substitute for gum consists in its being more flexible and less brittle, when dry, than that substance. For commercial purposes it is prepared on a large scale either by moistening potato-starch with weak nitric acid, then drying and heating to 110° C., or by simply heating the starch to about 250° C. When thus prepared, dextrin contains considerable amounts of dextrose and unaltered starch.

DEY, dā (Turk. *dāi*, maternal uncle). A title applied colloquially to any elder, especially in former times among the Janissaries; consequently, when the commander of that corps was associated with the Turkish pasha in the government of Algeria, the name was retained for him, and then transferred to any pasha or regent. Early in the eighteenth century the Dey of Algiers emancipated himself from the authority of the Sultan. Tunis and Tripoli were also sometimes ruled by deys in place of the bey. See BEG.

DHABB, dăb, or **DHOB**, dŏb. See DABB.

DHAK TREE, dạk *or* dăk. See BUTEA.

DHAL, däl. See PIGEON PEA.

DHAMMAPADA, d'hŭm'mȧ-pŭd'ȧ (Pali, foot-print of right). The name of a division of the sacred writings of the Buddhists. It has been translated by Max Müller, in vol. x. of the *Sacred Books of the East*.

DHAR, där. The capital of a native State of the same name in Central India, situated on the road between Mhow and Baroda, 1908 feet above the sea (Map: India, C 4). It is surrounded by walls and contains two large mosques. Ruins of considerable archæological interest testify to the ancient magnitude of the city, which is said to have had formerly a population of 100,000. Population, 18,400.

DHARMAŚASTRA, d'här'mȧ-shäs'trȧ. The name given to the metrical law books of Manu, Yajnavalkya, and others. The law book of Manu is relatively recent, but its date cannot be definitely fixed. It is translated by Burnell (London, 1884). Yajnavalkya's work dates from the third century A.D. A collection of these texts is given in the *Dharmaśastrasangraha*, edited by Pandit Jibananda Vidyasagara (Calcutta, 1876).

DHARMASUTRA, d'här'mȧ-sōō-trȧ. A division of the sutra or ritual literature connected with the Vedas. They are works which fix the rules of life in relation to others, and are the source of the Dharmasastra.

DHÂRWÂR, där'wär. The capital of a district of the same name in Bombay, India, in latitude 15° 28′ N. and longitude 75° 4′ E., close to the frontier of Madras (Map: India, B 5). It has a strong fort, and Government and native schools, and is an important railway centre. It has railway connection with Marmagoa in the Portuguese colony of Goa, through which port it carries on an extensive export trade in cotton. Population, in 1891, 32,841; in 1901, 31,279.

DHAWALAGIRI, dä'hwȧ-lä-gē'rē or **DHWALAGIRI** or **DHAULAGIRI** (Hind., white mountain). One of the highest peaks of the Himalayas (about 27,000 feet), situated in Nepal, near the parallel of 29° N. (Map: India, D 3).

DHEGIHA (d'hā'gē-hä) **INDIANS**. A group of Siouan tribes, which included the Osage, Omaha, Quapaw, Kansa, and Ponka Indians. See SIOUAN STOCK.

DHOLE, dōl. A wild dog of India. See DOG.

DHOURRA, dōōr'rȧ. See SORGHUM, paragraph *Non-saccharine*.

DHOW, dou. A vessel common to the Arabian Sea and the east coast of Africa. It is usually from 150 to 250 tons burden by measurement, and is built like a grab (q.v.) with 10 or 12 ports. The rig is usually lateen with a single mast and sail, and the latter is set on an enormous yard which is as long as the vessel. The halliards of the yard consist of a pendant and three-fold purchase. The lower block of the tackle is secured to the weather rail and the end of the fall is also made fast there; the tackle thus becomes the backstay for supporting the mast, the only other rigging on it being three shrouds each side.

DHULIP (d'hōō-lēp') or **DHULEEP SINGH** (1838-93). An Indian maharajah, son of the famous Runjit Singh, ruler of the Sikhs. Upon the death of his brother Charak Singh, Dhulip, although still in his minority, succeeded to the throne, but, after a prolonged but ineffectual warfare against the English, was compelled to conclude a treaty of peace at Lahore (March 9, 1846) according to the terms of which he consented to renounce the throne in consideration of an annuity of £40,000. He was subsequently educated in England and became a Christian, although his mother, Ranee Chunda Kour, who also resided in that country until her death, refused to renounce her creed. An attempt to reëstablish his authority in 1886 proved unsuccessful and resulted in the loss of his pension. After a desultory career in Russia and France, he was pardoned by the Queen and his pension was renewed.

DHUN'CHEE (E.Ind.), *Sesbania aculeata*. A plant of the natural order Leguminosæ. The dhunchee is an annual herbaceous plant, much cultivated in India upon account of its fibre; it has an erect, sparingly branched stem, 6 to 10 feet high. It is a plant of rapid growth, and succeeds best in low and wet soils. Its fibre is coarser than hemp, except when it is cut at a very early period of its growth, is durable in water, but contracts considerably when wetted. It is steeped and prepared very much like Sunn (q.v.). It is native to the Malabar coast and is also grown in China. It is sown at the rate of 30 pounds of seed per acre. The yield varies within wide limits, about 500 pounds of fibre per acre being a fair average.

DHYAL-BIRD, dī'ăl-bẽrd', or **DAYAL** (native of E. Ind.). An Oriental warbler of the genus Copsychus, of which several species are familiar visitors to gardens and villages throughout southeastern Asia. The best known is *Copsychus saularis*, common from Ceylon to China, and reminding British residents of their robin redbreast by its confiding and cheerful ways. It builds a rude nest in a hole in a tree, and during the breeding time is comically pugnacious. It has a pleasing song, and all the species are kept as cage-birds, and are susceptible of learning tricks. The dress of the male is black and white; that of the female brownish.

MALACCA DHYAL-BIRD
(*Copsychus musicus*).

DHYANI BUDDHA, d'hī-ä'nê bōōd'dȧ (Skt., meditation-Buddha, from *dhyāni*, devoted to meditation, from *dhyāna* Pali *jhāṇa*, meditation, from *dhyā*, to meditate + *buddha*, enlightened, p.p. of *budh*, to awake). One of five Buddhas, named Vairocana, Akshobhya, Ratnasambhava, Amitabha or Amitayu, and Amōghasiddhi, with their female counterparts, called Taras or Saktis. In some Buddhist texts their number is raised to six, ten, or even more. They are distinguished from the Adi Buddha (q.v.), or primeval Buddha, and all other incarnate Buddhas, as well as from the potential future Buddhas or Bodhisattvas, by being eternal, non-corporate, and produced from meditation alone. In Art the dhyani Buddhas are of the customary Buddha type, but are distinguished by varieties of ornamentation of their lotus-seats, and also by the positions of their hands, and sometimes by different colors of paint. Their sanctuaries, which have the shape of a pile of rice, are termed *Caityas*, instead of *Viharas* and *Stupas*.

DI'ABASE (from Gk. *δι-*, *di-*, double + *βάσις*, *basis*, base, a going, from *βαίνειν*, *bainein*, to go; influenced in form by Gk. *διάβασις*, *diabasis*, passage, from *διά*, *dia*, through + *βάσις*, *basis*, a going, base). A crystalline, igneous rock of which the essential constituent minerals are lime-soda feldspar and pyroxene (augite). The texture of diabase, while generally crystalline throughout, differs from that of granite in that the augite incloses the feldspar, owing to the later period of augite crystallization. The feldspar of diabase is usually in bladed crystals, which take all directions in the augite and give the rock a peculiar interlocking radial texture, which is especially noticeable in rocks of coarse grain. If the grains of augite be large in comparison with the size of the feldspar blades, the effect produced is a noteworthy mottling which is described as 'lustre mottling.' The average chemical composition of diabase varies but little from that of gabbro (q.v.), the difference of the two rocks being chiefly of structural nature. The closest affinities exist both chemically, mineralogically, and texturally between diabases and basalts (q.v.), and, indeed, most American petrographers recognize no important difference between them; the rocks of greater geologic age, which consequently show greater decomposition, being, however, more generally described under the term diabase and the more recent occurrences as basalt. Olivine, if present in a diabase, makes the rock an olivine diabase. Diabase is quite subject to alteration, the augite being replaced by hornblende and the olivine (if present) by serpentine. Both of the newly developed minerals being green, the rock assumes by this alteration a greener color. Important occurrences of diabase are: those of the copper-bearing Keweenawan series of Lake Superior; the Palisades of the lower Hudson River, and the Hanging Hills of Meriden, Conn., of Jura-Triassic Age; and those of the Deccan plateau of southern India. See GREENSTONE; BASALT; TRAP.

DIABETES, dī'ȧ-bē'tēz (Neo-Lat., from Gk. *διαβήτης*, *diabētēs*, siphon, from *διαβαίνειν*, *diabainein*, to stride, go through, from *διά*, *dia*, through + *βαίνειν*, *bainein*, to go). A disease of which the principal symptom is an abundant flow of saccharine urine. Diabetes is of two kinds: (1) *Diabetes insipidus* is a mere symptom of a functional condition now generally termed *polyuria*, or an increased flow of normal urine, excessive thirst accompanying it; it is infrequent and not dangerous. (2) *Diabetes mellitus* (Lat. *mel*, honey) is a grave disease in which the liver does not perform its proper work in transforming starches and sugars during assimilation, and large quantities of liver-sugar (resembling grape-sugar) appear in the urine. Inosit (q.v.), or 'muscle-sugar,' also appears in some cases in the urine. The cause of the disease is obscure, the pathology is uncertain, and the treatment is unsatisfactory. Patients suffering from diabetes, besides urinating very frequently and in large quantities, experience distressing thirst, with dryness of mouth and lips; loss of appetite, muscular weakness, emaciation, occasional ulcers, altered sight, and mental changes, generally consisting of confusion of ideas, indecision, and melancholia. In treating diabetic patients, a diet is prescribed of gluten bread, skim milk, cheese, eggs, meats, fresh fish, green vegetables, tomatoes, and sour pickles. Sugars, starches, and indigestibles should be absolutely avoided. Bread made of gluten flour is very unpalatable, and, practically, the strict diet is rarely observed by the patient. Van

Noorden showed, in 1903, that oatmeal may be substituted for bread without increase of glycosuria; Mossé reports similiar results with potatoes, in a smaller proportion of diabetics, and in the less severe cases. Several drugs are used, with varying success, including bromides and salicylates, opium, and digestants. Recovery is very rare. Temporary *glycosuria*, or sugar in the urine, occurs in some people after the use of chloral or the administration of an anæsthetic. Some always have a little sugar in the urine without having any other symptom of diabetes, especially gouty or very fat people. Diabetes is not, as is popularly supposed, a disease of the kidneys. No pathological changes are characteristic. Lesions of the medulla have been described, but the theory of a distinct "diabetic centre" in the medulla seems as yet to lack sufficient confirmation. Probably the most constant lesions are those found in the pancreas as noted by Lancereaux. The most common change is a simple atrophy of the pancreatic tissue, with or without an increase in the interstitial connective tissue. Dr. W. T. Bull, of New York, has reported a case in which diabetes followed removal of the pancreas, and the results of experimental extirpation of the organ lend weight to its possible importance as the causative factor in diabetes. Children of diabetic parents exhibit glycosuria during psychic strain or under amylaceous diet, and need most careful rearing. Consult Tyson, *Treatise on Bright's Disease and Diabetes* (Philadelphia, 1904). See DIET.

DI′ABET′IC SUGAR. A substance found in the blood and secretions of the higher animals, especially when afflicted with the disease called diabetes (q.v.). It is largely liver-sugar, closely resembling glucose (q.v.); partly inosit (q. v.).

DIABLE BOITEUX, dē′ȧ′bl′ bwä′tẽ′, LE (Fr., the lame devil). A famous satirical romance in dialogue form, by Le Sage (1707). It deals with the wonders wrought by a spirit, Asmodeus, whom Don Cleofas has accidentally released from imprisonment in a glass jar, and is chiefly derived from *El diablo cojuelo*, a Spanish work by de Guevara (1641). The satire furnished the basis for Foote's comedy *The Devil Upon Two Sticks*.

DIABLERETS, dē′ȧ′bl′-rā′ (Fr., little devils). A group of peaks in the western Bernese Alps, Switzerland, situated about 15 miles southeast of Lake Geneva, in the bend of the Rhone, in latitude 46° 20′ N. (Map: Switzerland, B 2). They range from 900 to over 10,500 feet high, and are covered with glaciers on the north and east slopes. Owing to their strata of limestone, sandstone, and gypsum, the Diablerets are gradually being undermined, and their mountain masses fall from time to time with destructive effect.

DIACHYLON, dī-ăk′ĭ-lŏn (Gk. *διάχυλος*, *diachylos*, very juicy, from *διά*, *dia*, through + *χυλός*, *chylos*, juice. A deceptive etymology). The common healing or lead plaster, made by combining litharge with olive oil. *Diachylon ointment* contains 500 parts of diachylon plaster, 490 parts of olive oil, and 10 parts of oil of lavender-flowers.

DIACRITICAL MARK or SIGN, or DIACRITIC (Gk. *διακριτικός*, *diakritikos*, distinctive, from *διακρίνειν*, *diakrinein*, to distinguish, from *διά*, *dia*, through + *κρίνειν*, *krinein*, to judge). A mark or sign used to distinguish different sounds or values of the same letter or character, such as those used in indicating the pronunciation or accent in this Encyclopædia. Such marks or signs may arise, (a) as a degradation or gradual corruption of some combination of previously used characters as in the case of the German umlauted vowels, ä, ö, ü; or (b) they may be deliberately invented or chosen for some special purpose, as in most of the systems used for phonetic respelling in works of reference or in philological works.

Some of those in the first class were developed by writing one letter above, as a means of saving time or space, especially at the end of a line, when books were made by copying by hand. Thus the German ä, ö, ü were originally aͤ, oͤ, uͤ, and the superior letters were, for convenience sake, reduced to two dots. So the Swedish å or Å was originally ao or Ao, written with the o over the a or A, this o being finally changed into a simple circle. The cedilla (literally, little zed or z), on the other hand, is a degradation of a variant form (ʒ or ȝ) of the letter z, which was formerly written after the letter c to show that it was to be pronounced like s, when without the cedilla it would have had the sound of k. It is now chiefly used in French and Portuguese words. The number of these diacritical marks resulting from degraded forms now or formerly employed in the various civilized languages is very large; but most of those now in use have either lost their primitive meaning or are of forgotten origin. To the class of arbitrarily invented or chosen diacritical marks belong most of those now in use in the alphabets of the civilized nations or races, such as those used in phonetic respelling and those used in the ordinary alphabets of many European nations whose alphabets have become fixed during comparatively recent times, as in the various Slavic alphabets, the Hungarian alphabet, etc. The points used in the Hebrew and Arabic alphabets, as well as those used in Avestan, are arbitrary inventions used to indicate the vowels or modifications of the consonantal sounds of the original characters.

The diacritical marks which occur in the printing of common English words are the diæresis [··], the hyphen [-], the cedilla [ç], the acute accent [′], the grave accent [‵], and the tilde [~]. By some authors the letter h when written after c or s or t is treated as a simple diacritic, although it is not properly a diacritical mark. The diæresis is a survival of the Greek use of two dots over *ι* or *υ* to show that they did not form a diphthong with the preceding vowel. It is used in the same way in English. The tilde is used in English only over foreign-derived words, as in the word cañon. It is a degradation or corruption of the letter n, which was formerly indicated in many words by making the sign ~, or even a straight mark [‒] over the preceding letter, as año = anno. When final -ed is to be pronounced contrary to the usual rule, the fact is usually indicated by using the grave or acute accent, thus *reachèd*, and in the same way the fact that a final e is to be pronounced is often indicated; thus, *Brontè*. The hyphen sometimes serves the purpose of the diæresis, as in *re-entry*. Some of the characters used in phonetic respelling have by long usage become more or less fixed in significance; thus the signs ‒ and ˘ are practically always used to denote long and short sounds respectively; and the sign ^ also usually denotes a long sound, as it did in Greek. In many modern English scientific works the acute accent [′] is used to denote a short accented vowel, and the grave accent [`]is used to denote a long accented vowel. So the scheme of diacritical marks used in this Encyclopædia is in very general use to indicate the sounds here denoted by them, being essentially the same as those employed in Webster's International Dictionary, and in various other preceding or abridged editions of the same work, and in the majority of the school books of the country. The system of the Century Dictionary is in many respects quite different; and that of the great English dictionary edited by Dr. Murray (*A New English Dictionary on Historical Principles*) is still different, and extremely complex. The system used by the Standard Dictionary contains fewer diacritical marks, the differentiation being obtained by the use of the alphabet arbitrarily devised and selected for use by the American Philological Association. See the articles PHONETICS; PRONUNCIATION, etc., and for the various diacritical marks employed in any language, consult a grammar of that language.

DIADEM (Lat. *diadema*, Gk. *διάδημα*, *diadēma*, fillet, from *διαδεῖν*, *diadein*, to bind round, from *διά*, *dia*, through + *δεῖν*, *dein*, to bind). The name given to the fillet of silk, woolen, or linen which served as the distinguishing ornament of kings. It was generally narrow, being only a little broader on the forehead. The diadem of Bacchus, as it appears in ancient sculpture, was a plaited band going round the forehead and temples, and tied behind, with the ends hanging down. Among the Persians the diadem was bound round the tiara or turban, and was of a blue color, worked with white. The early Roman emperors refrained from using this ornament, in order not to call up recollections of the hated kingly office. Diocletian was the first to introduce it again.

DIADEM SPIDER (so called from the marking). The common cross-spider (*Argiope diadema*) common everywhere in European gardens. See SPIDER.

DI'ADU'MENOS (Gk. *διαδούμενος*, *diadoumenos*, binding round, from *διαδεῖν*, *diadein*, to bind round). A celebrated statue by Polyclitus, representing a youthful athlete binding the fillet about his head. It is supposed to be a pendant to the "Doryphorus." The best reproduction extant, now in the British Museum, is of Roman origin and was found near Vaison, France.

DIÆRESIS, dī-ĕr'ē-sĭs. See DIACRITICAL MARKS.

DIAFOIRUS, dē'ȧ'fwä'rus'. A ridiculous quack in Molière's *Le malade imaginaire*, whose son Thomas is a suitor of Argan's daughter, Angélique.

DI'AGEOT'ROPISM (Gk. *διά*, *dia*, through + *γῆ*, *gē*, earth + *τρόπος*, *tropos*, a turning). That form of geotropism, i.e. sensitiveness to gravity, wherein the bending organ comes to grow in a direction at right angles to the direction of gravity. Rhizomes and runners of many plants possess this property. See GEOTROPISM.

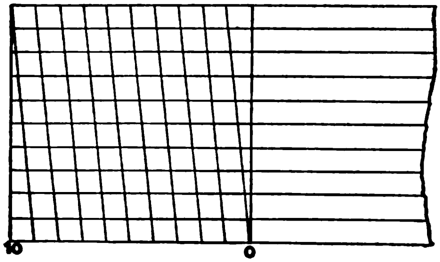
DI'AGNO'SIS (Gk. *διάγνωσις*, *diagnōsis*, discrimination, from *διαγιγνώσκειν*, *diagignōskein*, to discriminate, from *διά*, *dia*, through + *γιγνώσκειν*, *gignōskein*, to know). The determination of the nature of a disease as well as of the condition of the organ or tissues affected. This is the most important and difficult element in the practice of medicine. The methods of diagnosis are based on a study of symptoms, such as chill, fever, pallor, delirium; and physical signs, such as are appreciated by examination of the throat, chest, abdomen, eyes, urine, etc., with the aid of the thermometer, stethoscope, microscope, ophthalmoscope, electric battery, etc. To learn to make a diagnosis, the pupil must study disease at the bedside, and diseased and normal tissues, fluids, and organs, in the autopsy room and the laboratory, following the course of symptoms and signs from the invasion of disease to recovery or death.

DI'AGOM'ETER (Gk. *διάγειν*, *diagein*, to lead through, from *διά*, *dia*, through + *ἄγειν*, *agein*, to lead + *μέτρον*, *metron*, measure). A modified form of electroscope, invented by Rousseau, in which a dry pile is employed to measure the amount of electricity transmitted by different bodies, and thus determine their conducting power. The practical application of the instrument was to determine the purity of certain substances, such as olive oil, whose conductivity varies with an admixture of other oils or substances. The instrument consists of two small metallic plates, one of which is fixed while the other is fastened to the extremity of a magnetic needle. When at rest the two plates are in contact, but under the influence of a charge of electricity they tend to separate and the time required for them to reach a maximum position depends on the conductivity of the substance through which the current passes.

DIAG'ONAL (Lat. *diagonalis*, from Gk. *διαγώνιος*, *diagōnios*, diagonal, from *διά*, *dia*, through + *γωνία*, *gōnia*, angle). In plane geometry, a straight line joining any two non-adjacent vertices of a rectilinear figure. A line between two adjacent vertices would coincide with a line of the figure, hence a triangle has no diagonal. An ordinary four-sided figure, a quadrilateral, has two diagonals; a pentagon, five; a hexagon, nine, and so on. The general expression for the number of diagonals in such figures of n sides is $\frac{n(n-8)}{2}$, where n represents the number of sides. Thus the number of diagonals in a dodecagon (q.v.), a polygon of twelve sides, is $\frac{12(12-3)}{2} = 54$. If the polygons are general, that is, composed of lines of indefinite extent intersecting in the maximum number of points, the number of diagonals is given by tne formula $\frac{n!}{8(n-4)!}$, where n is the number of sides; e.g. in a general dodecagon the number of diagonals is $\frac{12!}{8(12-4)!} = 1485$.

A diagonal of a solid bounded by limited planes is a line joining any two vertices so situated that the line does not lie in any face. The number of diagonals in any regular polyhedron (q.v.) is given by the formula $ns \cdot \left\{\frac{ns - v^2(s-2) - v}{2v^2}\right\}$, where n is the number of faces, s the number of sides of a face, and v the number of faces grouped about the polyhedral vertices. Thus the cube has $6 \cdot 4 \cdot \left\{\frac{6 \cdot 4 - 3^2\ (4 - 2) - 3}{2 \cdot 3^2}\right\} = 4$ diagonals.

DIAGONAL SCALE. A system of lines by means of which fractional parts of a unit, usually hundredths, may be laid down or measured with compasses (q.v.). Such scales are of particular value in plotting maps from given data. (See SURVEYING.) In the figure the line from 0 to 10 represents one inch. The diagonal line which ends at 0 cuts off on the lines above



fractions of an inch, $\frac{1}{100}$, $\frac{2}{100}$, $\frac{3}{100}$; and so on. The next diagonal line cuts off $\frac{11}{100}$, $\frac{12}{100}$, ... of an inch; the next $\frac{21}{100}$, $\frac{22}{100}$, . . . of an inch; and so on. A pair of compasses may be set by such a scale so that its points are 1.01, 1.02, . . . 1.11, 1.12, . . . 1.21, 1.22, . . . 1.99 inches apart, and thus be used to plot chains and links on a map of a given scale.

DIAG'ORAS (Gk. Διαγόρας). A Greek poet and philosopher. He was born in Melos, an island of the Cyclades, and flourished in the fifth century B.C., but beyond his reputation for atheism, little is known regarding his career. He is said to have been a disciple of Democritus of Abdera, and to have resided during the more important part of his life in Athens, where he won considerable distinction as a lyric poet, but only the scantiest fragments of his verses survive. He is better known to the later world, however, as an atheist, and as such is alluded to by Aristophanes in the *Clouds* (B.C. 423), and the *Birds* (B.C. 414). Whether he was a thorough-going disbeliever in the gods and religion or simply a scoffer at the current religious practices and superstitions cannot now be determined, but in any case he was banished eventually for his opinions, and died in Corinth. Besides his lyrics, he is said to have written a work in two books, *Φρύγιοι Δόγοι*, exposing the sacred Mysteries (q.v.). Consult Zeller, *Philosophie der Griechen* i. (1892).

DIAGRAM (Lat. *diagramma*, Gk. *διάγραμμα*, figure from *διαγράφειν*, *diagraphein*, to describe, from *διά*, *dia*, through + *γράφειν*, *graphein*, to write). A figure so drawn that its geometric relations may illustrate the relations between other quantities. The area of a rectangle is the product of the numbers representing its length and breadth; the diagram of a rectangle is the visible symbol, corresponding to the equation $a = bl$; and, by analogy, the rectangle may be used to symbolize any quantity which is the product of two factors. Similarly, a parallelopiped may symbolize any quantity which is the product of three factors.

The purpose of many mathematical diagrams is simply illustration, and it is necessary only that the idea be clearly presented, accuracy of drawing being relatively unimportant—e.g. those showing electric connections require only a proper representation of the parts in their association with one another. Other diagrams, as those drawn for workmen by architects and engineers, are intended to furnish magnitudes or distances by actual measurement, and their execution cannot be too accurate.

A *profile* diagram shows such an outline as would be formed, for example, if a hill were cut through by a vertical plane, and the material on one side of the plane were removed. Evidently a succession of such profiles might be laid on the same sheet of paper, the lines being distinctly drawn, and the whole would serve to compare several vertical profiles of the same mass. It is not necessary that vertical and horizontal measurements should conform to the same scale, provided each series of measurements is consistent in itself. Thus *geographic* profiles, which include upon a single sheet the outlines of entire continents and ocean beds, usually have the vertical measurements on a scale several times as great as that used for horizontal distances; otherwise the diagram would be made inconveniently long, or the heights would be inconspicuously small. A *topographer's contour map* exhibits a series of curves, such as would be formed if a series of horizontal sections were made, and the outlines carefully drawn on paper. The drawing really shows the horizontal projections of the contour lines upon a surface parallel to the system. In *mechanical drawings*, particularly those designed to guide workmen in the construction of machinery, several connected views of the same object are required, each view giving some information which the others cannot furnish. Suppose three planes perpendicular to one another, like the bottom, one side, and one end of a rectangular box, and let an object, as a hexagonal nut, be placed within the trihedral angle thus formed. Looking from the front, we see an image of the nut projected against the back of the box; from the side, a different image is seen against the end of the box; from above, a third form appears against the bottom, while from some or all of these figures the necessary measurements may be obtained. If now the end of the box is swung outward into the plane of its back, and then both together are laid back into the plane of the bottom, we have the three coexistent drawings in one plane, and they may be transferred to, or be constructed on, one sheet of paper. In many cases the same points will find representation upon each diagram, and the fact may be indicated by the same letter; while the eye may be led from one position of the point to another by lines distinctively drawn to show that they are merely guides and not parts of the outline. See GEOMETRY, *Descriptive*.

Many devices have been invented by which diagrams illustrating natural phenomena may be automatically described. The physical experiment which produces the *parallelogram of forces* is a familiar example. As a more general illustration, suppose a spring *dynamometer* (q.v.) placed where it may receive the draught of a horse when moving a carriage. Let the movement of the spring be shown by an index whose motion is back and forth along a line in the direction of the draught. Fix a pencil to the index, and let its point rest upon a sheet of paper on a plane or a cylinder which moves at a uniform velocity in a direction perpendicular to the motion of the index. The combined movements of the pencil and paper beneath it will trace a more or less irregular line. If the force of draught is constant, the pencil will remain at a constant distance from the edge of the paper, and the trace will be parallel to the edge. If the paper does not move while the pencil varies, the line will be perpendicular to the edge. If both move, and the pencil is subject to a diminishing force, the trace will be oblique, approaching one edge; while if the force increases, the oblique trace will diverge from the same edge. Such mechanism is often arranged for instruments which indicate meteorological, physiological, or other changes, as the force and direction of winds, or the pulsation of the arteries (see SPHYGMOGRAPH), or the movements of a clock combined with the observations of an astronomer. (See CHRONOGRAPH.) An important application of the same principle is found in the *indicator diagram,* by which the pressure of the steam in the steam-engine and the work done by each stroke of the piston become matters of record. The paper moves with the movement of the piston, both in its excursion and return; the pencil moves at right angles to the direction of the motion of the paper, under the influence of the steam pressure, and the diagram drawn shows for each instant of the stroke the volume and pressure of the steam, while the total area of the diagram indicates the amount of work done. A mechanical device to illustrate the luminosity of various colors was invented by Newton, and is known as *Newton's diagram.* In mechanics the stresses on the various parts of a frame or bridge are graphically exhibited by a form known as a *stress* or *funicular* diagram. The *seismometer, seismograph,* or *seismoscope* is an instrument to record the velocity, direction, and magnitude of seismic waves. See HODOGRAPH.

DIAKOVA, dē′ȧ-kō′vȧ. A town of European Turkey, situated in the Vilayet of Kosovo, on a tributary of the White Drin, 20 miles northwest of Prisrend. Population, about 25,000, mostly Mohammedan Albanians.

DIAL (ML. *dialis,* daily, from Lat. *dies,* day), THE. A well-known American magazine, founded at Boston, Mass., in 1840, as the official organ of the so-called 'Transcendental' school of thought. As early as 1835 the idea was conceived by members of that school of idealists of starting a paper to be called *The Transcendentalist,* and Emerson, the same year, went so far as to suggest that Carlyle should be invited to come to America to assume the editorship of it. The scheme was not in that form realized, and the paper which finally appeared, *The Dial,* was not issued till July, 1840, with Margaret Fuller (see FULLER, SARAH MARGARET) as editor. At the end of two years she was succeeded by Emerson. The paper, through lack of funds, came to an end with the April number of 1844, after a career marked by unusual brilliance in its material and extraordinary fame on the part of its contributors. In it had been published, among others, Emerson's prose essays entitled "The Transcendentalist," "The Conservative," and some of his best-known poems, as "The Sphinx;" "Woodnotes;" "The Problem;" and "Fate." Constant contributors were Margaret Fuller, Amos Bronson Alcott, George Ripley, James Freeman Clarke, Theodore Parker, W. H. Channing, W. E. Channing, and Henry David Thoreau, who wrote for nearly every number. A reissue of *The Dial* has been published by the Rowfant Club. Consult Cooke, *Historical and Biographical Introduction* to the Rowfant reissue (London, 1902).

DIAL AND DIALING. A sun-dial is an instrument for measuring time by means of the motion of the sun's shadow. It is an instrument of very great antiquity, the earliest mention of it being in Isa. xxxviii. 8; and before clocks and watches became common it was in general use as a timekeeper. The art of constructing dials to suit any place and situation was then an important branch of mathematical study; now the subject is more an object of curiosity than utility.

A dial consists of two parts—the *stile,* or gnomon, usually the edge of a plate of metal, made parallel to the earth's axis, and pointing toward the pole; and the *dial plane,* which may be of any hard substance, and on which are marked the directions of the shadow for the several hours of the day, their halves, quarters, etc. Dials receive various names, according, mostly, to the positions which they are constructed to occupy. When the dial plane is on the plane of the horizon, the dial is called a horizontal dial; when perpendicular to that plane, a vertical dial. An equinoctial dial is one whose plane is parallel to the equator. Besides these names, there are others, such as the south dial, north dial, east dial, west dial, polar dial, declining dial, of which it is useless to write at length. These names all depend on the position of the dial plane. The cylindrical dial is a dial drawn on the curved surface of a cylinder. The ring dial is an ingenious small portable dial, but rather a curious toy than a scientific instrument.

A *night* or *nocturnal dial* is an instrument for showing the hour of the night by the shadow of the moon or planets. Moon-dials may be constructed relative to the moon's motion; or the hour may be found by the moon's shadow on a sun-dial by computation.

DIALING. The *stile* of a dial being parallel to the earth's axis, those familiar with spherical trigonometry will readily see that the problem of constructing a dial resolves itself into that of ascertaining where the hour-lines cut a given circle, with a view to the graduation of the dial plane. But even without a knowledge of trigonometry the principle may be readily understood from the following illustrations. Suppose a hollow and transparent sphere, as of glass, to represent the earth; and suppose its equator divided into twenty-four equal parts by the meridians, one of them passing through a given place—say London. (See HORIZON.) If the hour of twelve be marked at the equator, both on the latter meridian and that opposite it, and all the rest of the hours in order on the other meridians, those meridians will be the hour-circles of London, because, as the sun appears to move round the earth in twenty-four hours, he will pass from one meridian to another in one hour. Then, if the sphere has an opaque axis, terminating in the poles, the shadow of this axis would fall, in the course of the day, on every particular meridian and hour, as the sun came to the plane of the opposite meridian, and would thus show the time at London and at all other places on the same meridians as London. If the sphere were cut through the middle by a plane in the horizon of London, and if straight lines were drawn from the centre of the plane to the points where its circumference is cut by the hour-circles of the sphere, those lines would be the hour-lines of a horizontal dial for London; for the shadow of the axis would fall upon each particular hour-line of the dial when it fell upon the like hour circle of the sphere. Similarly, if we suppose the sphere cut by *any* other plane facing the meridian, the hour-circles of the sphere will cut the edge of the plane in those points to which the hour-lines must be drawn straight from the centre, and the axis of the sphere will pass a shadow on these lines at the respective hours. The like will hold in general of any plane, whether it face the meridian or not. The positions on the dial plane of the several hour-lines can be calculated if we know the latitude of the place where the dial is to be used and the position of its plane relatively to the horizon and meridian.

The *universal dialing cylinder*, an invention of Ferguson's, is a glass cylindrical tube closed at both ends with brass plates, on the centres of which a wire axis is fixed. The tube is either fixed to a horizontal board at an angle equal to the latitude of the place, or moves on a joint, so that it may be elevated till its axis is parallel to the earth's at any latitude. The twenty-four hour-lines are drawn on the outside of the glass, equidistant from one another and parallel to the axis. The XII on the upper side of the cylinder stands for midnight; the XII next the board for noon. When the axis is adjusted for the latitude and the board leveled, with both XII noon and midnight in the plane of the meridian, and the end toward the north, the axis, when the sun shines, will serve as stile, and cast a shadow on the hour of the day among the parallel hour-lines. As the plate at the upper extremity of the cylinder is perpendicular to its axis and parallel to the equator, right lines drawn from the centre to the extremities of the parallels will be the hour-lines of an equinoctial dial, and the axis will be the stile. A horizontal plate, if put into the tube, with lines drawn from the centre to the several parallels cutting its edge, will be a horizontal dial for the given latitude; and similarly, a vertical plate fronting the meridian and touching the tube with its edge, with lines drawn from its centre to the parallels, will be a vertical south dial, the axis of the instrument in both cases serving for the stile, and similarly for any other plate placed in the cylinder. If, instead of being of glass, the cylinder were of wood, any of these dials might be obtained from it by simply cutting it in the planes of the plates and drawing the lines on the surface of the section.

DIALECT (Lat. *dialectus*, from Gk. *διάλεκτος*, *dialektos*, dialect, discourse, from *διαλέγεσθαι*, *dialegesthai*, to converse, from *διά*, *dia*, through + *λέγειν*, *legein*, to say). The name *dialect* is given to those varieties or peculiar forms which a language assumes among the various tribes or other local divisions of a people. It is clear that the wider the separation comes to be between the several tribes, and the more they differ in mode of life and other circumstances, the more marked will become the differences of dialect. Also, when a particular tribe of this people increases in numbers and extends its territory, the same process is repeated, and its dialect is broken into a number of sub-dialects. The principal check upon this tendency to seemingly endless subdivision of language is furnished by an increasing degree of common culture and civilization. Where this is wanting, as in Africa and among the native populations of America, the subdivision is practically endless.

Another element is introduced into the problem by the fact that the civilization of some tribes develops more richly and ripens earlier than that of others, while some even undergo decline; this must occasion corresponding differences of dialect. Further, one dialect may become dominant over one or more of the others, through various influences, the chief of these being the power of poetry, especially if favored by external relations. Finally, if to superior manifestations of oratory and poetry in any dialect, the conservative aid of writing be added, there is created a written language; and this passes current among other tribes to the same extent that the literature of which it is the vehicle finds favor. It is not always the dialect most perfect in itself, nor yet that of the most powerful tribe or division of a people, that comes to be the written language. Accidental circumstances have in many cases decided the rivalry. The Bible happened to be translated by a High German, Luther, into his native dialect; other works on the all-engrossing subject of religion followed in the same dialect; happily, too, the art of printing had just attained the perfection necessary to give these productions general circulation. It was this concurrence of circumstances that decided that High German should in future be the spiritual bond between the widespread German people. For there were other dialects whose claims to the distinction were at that time equal, if not higher. See also ENGLISH LANGUAGE.

When a dialect has thus become the vehicle of written communication, and of the higher kinds of oral address, its character and position become changed, and it stands henceforth in a sort of antagonism to the other dialects, and even to that out of which it sprang. As written language is chiefly employed in the higher departments of human thought and activity, the intellectual and moral elements predominate in it over the sensible; and what it gains in dignity, precision, and pliancy, it loses in richness of inflection, in friendly familiarity, and naturalness. In conflict with this standard speech, the dialects must go to the wall. They live for a considerable time, it is true, even in the mouth of the educated classes, but they are gradually more and more confined to the most necessary and familiar forms of intercourse, and lose their characteristics in the stream of the written language. They thus become, after a time, the exclusive possession of the illiterate, in which position they preserve many relics of old grammatical forms long after these have disappeared from the language of literature. But so long as a language lives, the literary standard and the dialects never cease to act and react on one another.

The chief points of difference between dialects and the standard tongue fall under four heads. The first consists of differences in the elementary sounds, each dialect having a tendency to substitute some one or more vowels or consonants for others. Thus, the standard English *bold* is, in Ireland, *bowld;* in Scotland, *bauld; what,* where the *h* is nearly evanescent, becomes, in a Scotchman's mouth, or rather throat, *chwat,* and, in Aberdeenshire Scotch, *fat—f* in this dialect being regularly substituted for *wh,* or rather *hw.* (2) Each dialect has peculiarities of grammar: In many parts of England, and in Scotland, the plural of *eye* is not *eyes,* but the archaic *eyen,* or *een,* like *oxen.* The habitual use of *be,* where the standard grammar prescribes *am, is, are,* etc., is prevalent in large districts of England. Of this kind is the use of the strong conjugation for the weak, or vice versa; as *loup, lap, luppen,* for *leap, leaped, leaped.* (3) Peculiarities of vocabulary: Those individual words current in one or more districts, but unknown to the standard vocabulary, are properly *provincialisms.* They are usually genuine words of an older stage of the language, that have survived longer in some localities than in others. Some provincialisms, as *bearn* or *bairn,* for child, *marrow* for fellow or match, to *greet* for to weep, are common to Scotland and the north of England. Others are more local, as to *cleam,* for to fasten or cement; *heppen,* a Yorkshire term for pretty near; *thrippa,* in Cheshire, to cudgel. The exclusion of such words from the standard language is often accidental, and many of them might be and are with advantage resumed; as *marrow, gloaming,* etc. (4) Peculiarities of intonation: This is sometimes, though with little propriety, called accent, which means strictly the stress laid upon a particular syllable of a word. There are no doubt local peculiarities of this kind, too. The tendency of standard English, especially the more recent, is to throw the accent toward the beginning of the word; in Scotland, the tendency lingers to say *envy'* for *en'vy.* But peculiarities of intonation lie in the different ways in which the *pitch* of the voice is managed—in the musical accompaniment of articulation. Differences in this respect give rise to the monotonous drawl of one district, the angry, querulous tone of another, the sing-song of a third, etc.

So long as dialectic varieties of language were looked upon indiscriminately as corruptions and barbarisms, they were noticed by schools only that such corruptions might be avoided. A more rational philology, without trenching upon the rules of good writing, considers them essential parts of the speech of a people, and a knowledge of them necessary to any thorough investigation of the genius of that speech. It is obvious that *dialect* is entirely a *relative* term, and that what we call by that name in one connection we may call a language in another connection. Thus, Greek and Latin may be called sister dialects of that primitive language from which it is held that they, as well as the other members of the Indo-Germanic family, branched off. (See INDO-GERMANIC LANGUAGES.) Greek spoken of by itself, however, is a language, and Ionic, Doric, Attic, etc., are dialects of it. The same holds good with the others. In practice, however nearly related the speech of two peoples may be, we do not apply the term dialects, unless the peoples are mutually intelligible and have a common literary standard.

For several centuries collections of dialectic words have been made, but it is only within recent years that the subject has been studied scientifically and with reference to the exact sounds of dialectic words. The last stage in the study of the English dialects is marked by the publication of the *English Dialect Dictionary,* edited by J. Wright (London, 1898 et seq.). A list of the most important glossaries and grammars of the English dialects is given in Paul, *Grundriss der germanischen Philologie* (Strassburg, 1896), and a shorter list may be found in Sonnenschein, *Best Literature* (London, 1895). A study of the American dialects is being conducted by the American Dialect Society, the results of which are appearing in the *Dialect Notes* (Norwood, Mass., 1890 et seq.). The investigation of the German dialects is summarized in Paul's *Grundriss.* Of the Scandinavian languages the Swedish has been most carefully studied on this side, several journals being devoted to the subject. For the dialects of the Romance languages, consult: Gröber, *Grundriss der romanischen Philologie,* vol. i. (Strassburg, 1888); and for the Greek dialects: Meister, *Die griechischen Dialekte* (Göttingen, 1889); Hoffmann, *Die griechischen Dialekte* (Göttingen, 1891-93); Smyth, *Greek Dialects* (Oxford, 1894). For the Italic dialects consult Conway, *Italic Dialects* (Oxford, 1900). See AMERICANISMS; ENGLISH LANGUAGE; and articles on other languages.

DIALECTIC (Lat. *dialecticus,* Gk. *διαλεκτικός, dialektikos,* from *διάλεκτος, dialektos,* discourse, dialogue). A philosophic term that was first used by Socrates and Plato to designate the Socratic method of taking up some conception and showing the inadequacy of popular views concerning it, by debating about their deficiencies and inconsistencies; hence the name given it. Aristotle used 'dialectic' in the sense of probable reasoning. After this, 'dialectic' came to imply a sort of word-fence, the art of so using the forms of reasoning as to confound your opponent and 'make the worse appear the better cause.' Kant used the term to designate that part of his *Critique of Pure Reason* which exposes the fallacies into which one falls who tries in knowledge to transcend the limits of experience. Hegel restored the word to its original Socratic meaning, and called his system dialectical because it sought to show the insufficiency of many conceptions in ordinary use, and to discover the missing elements. Dialectic is sometimes used as synonymous with logic. Logic, however, which originated with Aristotle, is properly the science of the forms of thinking; it is less directly concerned with words than dialectic, which in this view becomes a subordinate province of logic—the art of disputation. Dialectic, in fact, is little heard of where philosophy is positive and experimental; it is chiefly used with regard to the more ideal and *a priori* speculations of such philosophers as Kant, Hegel, Schelling, etc.

DIALLAGE, dī'*a*l-lāj (Neo-Lat., from Gk. *διαλλαγή, diallagē,* interchange, from *διαλλάσσειν, diallassein,* to interchange, from *διά, dia,* through + *ἀλλάσσειν, allassein,* to change). A thin foliated or lamellar variety of pyroxene of a green to brown color. It is seldom found crystallized, but usually massive, with a pearly lustre. Its composition is similar to that of *diopside* (calcium magnesium silicate), but it sometimes contains alumina, when it should properly be classed with *augite.* By some authorities it is believed to be an altered augite. It is widely distributed, and is found in the early rocks. Certain varieties, especially those possessing a characteristic lustre, have been cut and polished.

The name diallage is also applied to the mineral *enstatite* and its ferriferous variety, *bronzite.*

DIALOGUE (Lat. *dialogus*, Gk. *διάλογος*, *dialogos*, speech, from *διά*, *dia*, through + *λόγος*, *logos*, speech, from *λέγειν*, *legein*, to speak). A conversation between two or more persons, implying, however, greater unity of subject and formality than an ordinary conversation. The Socratic dialogue is a conversation in the form of question and answer, so contrived that the person questioned is led himself to originate those ideas that the questioner wishes to bring before him. The dialogues of Plato are, as it were, philosophical dramas, in which the Socratic method of investigation is brought to bear upon speculative subjects. And in general among the ancients the dialogue was a favorite form for didactic literature. Aristotle employed it, but in less dramatic form than Plato; and Cicero chose the Aristotelian dialogue for his philosophical works. Lucian employs it for purposes approaching those of the drama. Of the more eminent modern writers in this form, we may mention Erasmus in Latin; Hutten, Lessing, Herder, Wieland, and Schelling among the Germans; Petrarch and Macchiavelli in Italy; Fénelon, Fontanelle, and Voltaire in France; and Berkeley, Hurd, and Harris in England. Landor's *Imaginary Conversations* also are a happy effort of this kind. When dialogue is combined with action, we have the drama. On the ancient dialogue, consult Hirzel, *Der Dialog* (Leipzig, 1895).

DIALOGUE OF DEATH. A religious work by William Bullein, written and published during the London Plague (1664-65) and professing to be "a goodly regimente against the fever Pestilence."

DIAMAGNETISM (from Gk. *διά*, *dia*, through + *μάγνης*, *magnēs*, magnet, from *Μάγνης*, *Magnēs*, Magnesian, from *Μαγνησία*, *Magnēsia*, a city of Thessaly. in Greece, where magnetic stones abounded). A name given certain magnetic phenomena observed in the case of bismuth and some other substances. If a small piece of bismuth is brought near one pole of a strong magnet, it will be seen to be repelled. This is owing to two things: (1) the magnetic field at the end of the magnet is not uniform, being strong near the magnet and feeble at a distance; (2) the surrounding medium is air. If the field of magnetic force were uniform, there would be neither repulsion nor attraction, the piece of bismuth would simply turn and take up a definite position. Further, Faraday has shown that the question of attraction or repulsion depends not on the body itself, but on its magnetic properties with reference to those of the surrounding mediums. (See MAGNETISM.) Faraday showed that the following substances and a few others were diamagnetic when placed in air: bismuth, antimony, tin, zinc, cadmium, mercury, silver, copper, gold, lead, sulphur, sugar, wood, water, alcohol.

DIAMANTE, dē'ȧ-män'tȧ, JUAN BAUTISTA (c.1626-c.1690). A Spanish dramatist. He was born in Madrid, where about one-half of the fifty plays written by him and still extant were published in book-form (2 vols., 1670 and 1679). His best work is the tragedy entitled *El honrador de su padre.* Among his other pieces *La judía de Toledo* has probably enjoyed the greatest popularity. He was a knight of Saint John of Jerusalem and probably, like Calderon, Lope de Vega, and several other celebrated poets, spent the closing years of his life in the midst of his brotherhood.

DIAMANTINA, dē'ȧ-mȧn-tē'nȧ. An episcopal city in the State of Minas Geraes, Brazil, situated 146 miles northeast of Ouro Preto, and 4000 feet above sea-level (Map: Brazil, J 7). It is the centre of a diamond-producing district, and has diamond-cutting and goldsmiths' establishments, as well as cotton and leather manufactures, and a trade in diamonds amounting almost to $1,000,000 annually. Diamantina was founded in 1730. It formerly bore the name Tejuco. Population, in 1890, 14,000.

DI'AME'NIA. A genus of elapine venomous snakes of Australia. See GRAY-SNAKE.

DIAM'ETER (Lat. *diametros*, from Gk. *διάμετρος*, diameter, from *διά*, *dia*, through + *μέτρον*, *metron*, measure). A diameter of a conic section (q.v.) is any chord which connects the points of contact of parallel tangents. In the circle, ellipse, and hyperbola, all diameters pass through the centre (see CURVES) and are bisected by it. Only the circle has all diameters equal, and each bisects the chords perpendicular to it. In the ellipse only the diameters called the minor and major axis bisect the chords perpendicular to them. In the parabola all diameters are parallel to the axis. (For conjugate diameters, see CONJUGATE.) Certain solid bodies also have diameters. In the sphere and the ellipsoid, the lines passing through the centre are called diameters and are bisected by the centre. See AXIS.

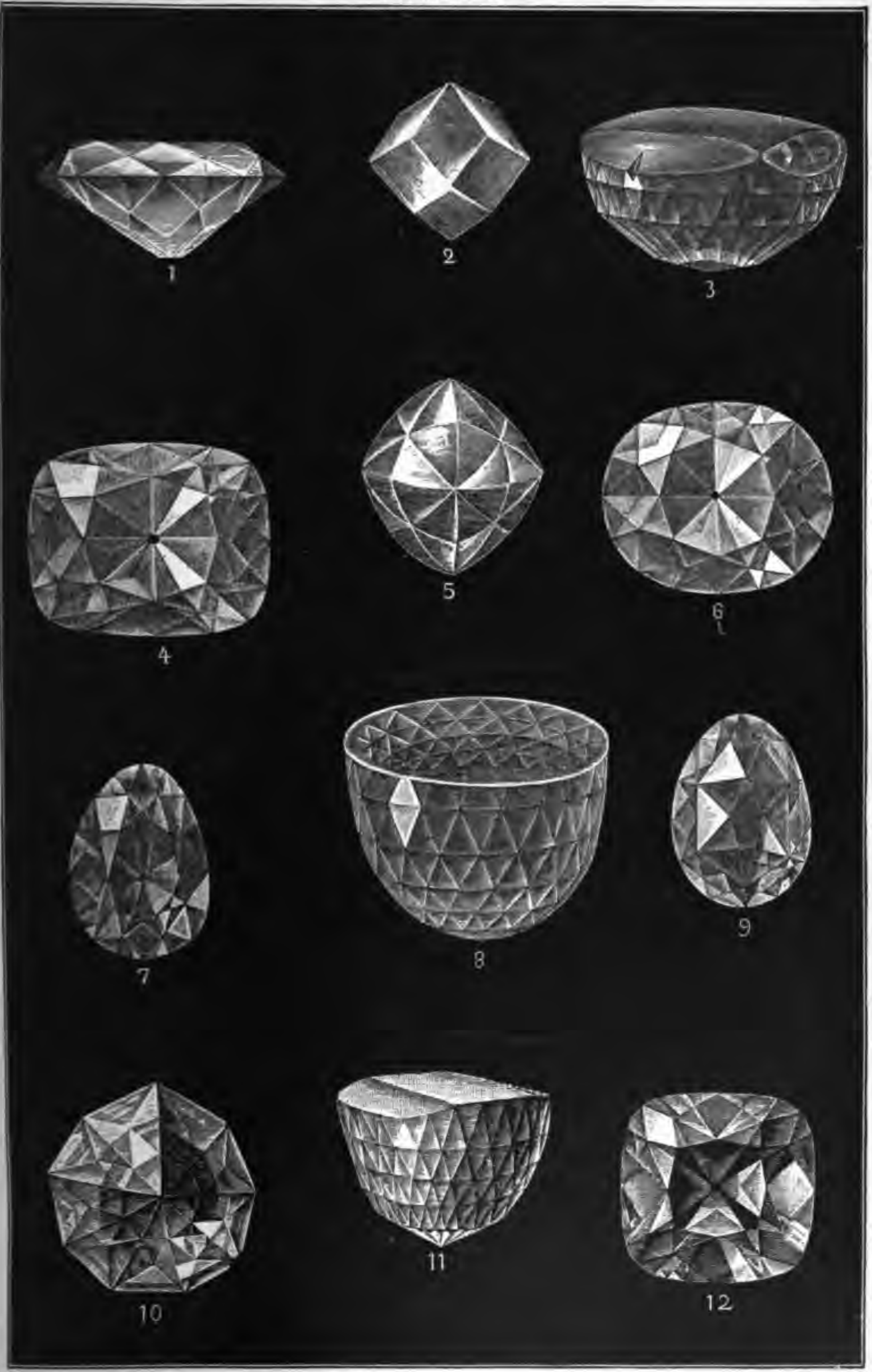
DIAMOND (OF., Fr. *diamant*, It., Sp. *diamante*, from Lat. *adamas*, adamant, diamond, from Gk. *ἀδάμας*, *adamas*, adamant, from *ἀ*, *a* priv. + *δαμᾶν*, *daman*, Skt. *dam*, to subdue). A precious stone composed of pure carbon, remarkable for hardness, lustre, and flash of color. It crystallizes in the isometric system, usually in octahedrons, or in combinations of several forms, including the octahedron, cube, rhombic dodecahedron, trisoctahedron, and hexoctahedron; the faces and edges of the crystals frequently are curved. It has a very perfect cleavage, by which the primary form of the octahedron may be derived. The diamond is not acted upon by acids or alkalies, but if heated to a high temperature in the presence of oxygen it burns to carbon dioxide. Its brilliant lustre and display of prismatic colors are due to the property of refracting and dispersing the light-rays, a property possessed in the highest degree by colorless stones. The specific gravity of the diamond is 3.52; its hardness, which is assumed to be 10 on the mineral scale, exceeds that of any other known substance. By friction it becomes phosphorescent and positively electric. The diamond has a great variety of natural colorings; white, yellow, and brown specimens are the most common, but pure white and fine shades of brown and yellow are quite rare and command high prices. Red in rich, deep tints is perhaps the most prized of all colors, while blue and green are also highly valued owing to their beauty and rarity. The amorphous steel-gray to black diamond, known as 'bort' or 'carbonado,' which is unsuitable for gems, is extensively used on the cutting edge of drills for tunneling and prospecting.

OCCURRENCE. Previous to the discovery of the Brazilian mines in 1727, diamonds were found chiefly in India and Borneo. In India they have been obtained near Kadapa, Karnul, and Bellari in Madras Presidency; near Nagpur, in the Central Provinces; and at Panna, in Bundelkhand. The famous Golconda was a market in Madras Presidency where the diamonds were collected from the mines. Formerly the diamond-mining industry gave employment to a large number of people, but, owing to the gradual exhaustion of the deposits and the crude methods of working, it has steadily declined. The diamond-mines of Borneo, which supply about 3000 carats annually, are located in the western part of the island near Pontianak. The Brazilian diamonds come from a small district within the States of Bahia, Minas Geraes, Goyaz, and Matto Grosso, being found for the most part in placers. Diamantina, Bagagem, and Abaete in Minas Geraes are the principal localities for gem-stones, and Lençoes, Sincorâ, and Santo Ignacio for carbonados. The alluvial deposits consist of water-worn quartz pebbles, and ferruginous clay, carrying rutile, hematite, ilmenite, and other minerals besides the diamonds. In one locality (Bagagem) the stones are found in a weathered, decomposed phyllite; they are also known to occur elsewhere in conglomerate. The total output of the Brazilian mines up to the year 1899 has been estimated by one authority at 13,105,000 carats. The most valuable specimen from this source is the "Southern Star," found in 1854, which weighed 254 carats in the rough, and 124 carats after cutting. The South African diamond-fields yield about 98 per cent. of the total product. Their discovery in 1867 came from the purchase of a stone that had been picked up by the children of a Boer farmer, and which was subsequently sold in Paris for $2500. The diamonds are found in both river diggings and dry diggings. River diggings occur along the Vaal River from Potchefstroom down to the confluence with the Orange, and up the latter river as far as Hopetown. Mining is conducted in a similar manner to gold-washing, the operations usually being on a limited scale. The dry diggings are in Griqualand West, on the borders of the Orange River Colony, about 640 miles northeast of Cape Town. They comprise a number of small areas of circular or oval form, ranging in diameter up to one-fourth of a mile. They are worked by a single company, the De Beers Consolidated Mines, Limited. The mines are opened on a large scale, and yield enormous profits. It is stated that the output from 1867 to 1897 was over 33,000,000 carats, or about 7½ tons, valued after cutting at $450,000,000. Quite recently another diamond field has been opened in Transvaal, near Pretoria. The largest mine is the Premier which has been proved to be very rich. The South African diamonds in the average do not equal the Brazilian for purity, although some of the most valuable stones, remarkable for quality as well as for size, have been found in these mines. Other countries where diamonds are known to occur are the United States, British Guiana, Russia, China, Sumatra, and Australia. In the United States there are no deposits, so far as discovered, of sufficient value to warrant mining operations, the stones being found only occasionally in alluvial materials and drift. More than fifty specimens have been identified, of which the largest, weighing nearly 24 carats, was found at Manchester, Va., in 1855. Their occurrence is generally confined to the regions of the southern Appalachians, the Great Lakes, and to the Coast and Sierra Nevada ranges of California and Oregon. The diamond-fields of British Guiana are about 250 miles up the Mazaruni River, and, while new, they give some promise of future importance. New South Wales produces about 25,000 carats annually from alluvial washings near Mudgee, and on the Macquarie River. In Russia, diamonds occur on the western slopes of the Urals, and are obtained in the washing of sands and gravels for gold.

ORIGIN OF DIAMONDS. The problem as to the origin of the diamond, once a favorite subject of speculation, has been studied recently by scientists with some success. In this connection, the South African fields are most significant. As previously stated, the deposits are circular or oval in form, and it has been found that they are inclosed by a wall of carbonaceous shale. For a considerable distance below the surface, the deposits consist of a yellowish, friable material called by the miners 'yellow ground,' but when, with depth, the limit of atmospheric weathering has been reached, they pass into a partially serpentinized olivine-pyroxene rock of igneous character, known as 'blue ground.' These facts indicate that the deposits occupy the vents or pipes of ancient volcanoes, and it is therefore probable that the presence of the diamond is connected with volcanic activity, the stones either having been brought up from the interior of the earth, or having been formed in place under the influence of the molten rock in contact with the carbonaceous shale. The French geologist De Launay has argued that the diamonds have come up from below. This view seems to be supported by the fact that their occurrence is apparently independent of the inclosing rock, whether this be the carbonaceous shale found at the surface or the underlying diabase and quartzite. The conditions necessary for the crystallization of carbon in the form of diamond would seem to be intense heat and great pressure, such as exist during the formation of igneous rocks. Successful attempts to reproduce these conditions artificially have been carried out by Professor Moissan of Paris, and also by the English chemist Professor Crookes. The method employed consists in heating pure prepared carbon and iron in an electric furnace. By sudden cooling of the molten iron, the surface contracts and exerts a powerful pressure upon the interior mass. When cold, the iron is dissolved in acid, and small black particles remain which exhibit the properties of genuine diamonds.

VALUE. The value of gem diamonds cannot be determined by absolute standards. Weight, cut, brilliancy, color, and perfection of the stones are factors that must be considered in estimating the value, which is, moreover, subject to fluctuation. Colorless stones bring higher prices than off-colored stones, but if decided tints of red, blue, or green are present they may increase the value abnormally. The value ordinarily increases in a ratio increasing with the weight,

DIAMONDS



REMARKABLE DIAMONDS.

1 and 4. SOUTHERN STAR. 2 and 5. NATURAL CRYSTAL FORMS. 3 and 6. KOH-I-NUR—Old and new cuttings.
7. GREEN DIAMOND, in Green Vault, at Dresden. 8. GREAT MOGUL. 9. SANCY. 10. FLORENTINE.
11. ORLOFF. 12. REGENT, or PITT.

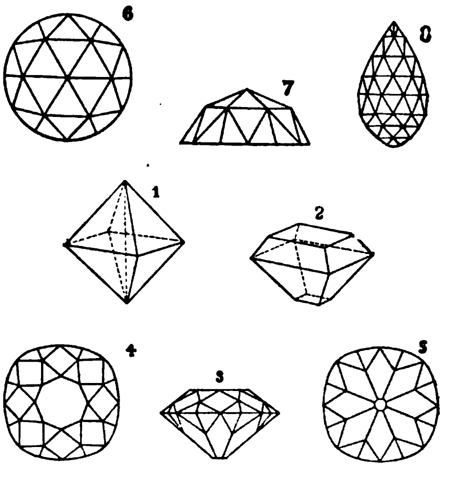
but this rule does not hold good for the largest stones, the prices of which cannot be fixed. Diamonds in the rough generally average $8 to $15 the carat for the run of the mine.

Remarkable Diamonds. The most valuable gems, are generally owned by royal families or are treasured by governments as State jewels. One of the largest is the Orloff, owned by the Czar of Russia, which weighs 195 carats, and is cut in rose form. Its origin is doubtful; according to one account, it was stolen from a Brahman temple in India, while another indicates that it was owned by Nadir Shah of Persia, and came after his death into the hands of an American merchant. In 1772 it was purchased by the Empress Catherine II., at a price said to have been $450,000, besides an annuity of $4,000 and a Russian title. The Koh-i-nûr, weighing 102¾ carats, and owned by the royal family of England, was found, according to legend, in India long before the Christian Era. After having been handed down through a long line of Indian princes, it was seized during the British invasion of the Punjab, and carried to England. The Regent or Pitt diamond in the Louvre, in Paris, weighs 136 carats, and is valued at $2,500,000. It is perhaps the finest of large brilliants. The Hope diamond, weighing 44¼ carats, is a beautiful blue stone, valued at $125,000. Among the most valuable stones found in recent times are the Victoria, weighing 180 carats, which was purchased by the Nizam of Hyderabad; the De Beers, weighing 225 carats; and the Tiffany, weighing 125 carats.

The largest and in many respects the most remarkable diamond of which there is any record was found on January 26, 1905, in the Premier mine near Pretoria, Transvaal. The stone—called the Cullinan diamond, from the name of its finder—weighed 303.2 carats in the rough and measured 4 inches by 2.5 inches by 1.25 inches. It shows five cleavage planes, indicating that it is only a portion of a large crystal. The color is reputed to be the purest of any of the large stones. Its value has been estimated at from $2,500,000 to $5,000,000.

Diamond-Cutting. The art of diamond-cutting was not developed until the middle of the fifteenth century, although crude methods of polishing were in use long before that time. About 1470 a guild of lapidaries was established at Bruges, under the direction of Louis de Berquem, who is thought to have been the first to devise a regular plan for the arrangement of facets, so as to increase the color effects in gems. Other guilds were soon founded in Antwerp and Amsterdam, and these cities rapidly gained preeminence in the industry, a position they still maintain.

In diamond-cutting, the operations are performed with the single object of producing the most valuable gem from a crude stone. The apparatus used is simple, but its manipulation requires both skill and experience. In the first place, the stone must be examined carefully to determine its shape, color, and the possible presence of flaws, as these features will govern the operation of cutting. If the shape is such that it cannot be reduced readily to one of the usual forms, the stone may be divided into two or more parts by taking advantage of the natural cleavage. The diamond is cemented to a wooden holder and a steel blade is applied in a direction parallel to an octahedral face. A sharp blow upon the back of the blade is sufficient to accomplish the cleaving. The next process (bruting) brings out the facets. Two rough stones, fixed at the end of holders, are held in either hand of the operator, who presses them against each other, at the same time giving them a rubbing motion. The friction wears away the surfaces gradually until they coincide in position to two of the facets. The diamonds are then cemented in new positions, and the operation is continued. The waste particles of dust are collected and used in the final process of polishing. For this the apparatus consists of a small disk of spongy cast-iron, turning on a vertical spindle at a speed of 2000 to 3000 revolutions per minute. The stone, imbedded in the apex of a metallic (lead-tin) cone is held by a clamp against the surface of the disk, which is smeared from time to time with a mixture of olive oil and diamond-dust. This operation requires constant attention, as the stone may be permanently damaged by over-heating.



DIAMOND-CUTTING.

Figs. 1-5—the Brilliant: 1 and 2, fundamental form; 3, 4, 5, side, top, and back views of the cutting. Figs. 6 and 7, top and side views of the Rose cutting. Fig. 8, view of the Briolette cutting.

Of the several forms in which diamonds are cut, the *brilliant* is the favorite. It is derived from the fundamental octahedron and requires, when perfect, 58 facets. In the middle is an octagonal facet called the 'table,' which is surrounded by 32 smaller facets, reaching to the line of union (girdle) between the upper and lower portions. On the lower portion there are 24 facets symmetrically arranged around the 'culet.' The *rose* form is used for thin stones. It consists of a number of triangular facets, the apices of which meet in the crown, and whose bases are supported by a second row of facets extending to the girdle. The lower part is perfectly flat. In the *briolette* the stone is cut into triangular facets, but the form is pear-shaped and there is no girdle.

Bibliography. Kunz, *Gems and Precious Stones* (New York, 1900); Streeter, *Precious Stones and Gems* (London, 1894); Streeter, *The Great Diamonds of the World* (London. 1882); Church, *Precious Stones* (London, 1883); De

Launay, *Les diamants du Cap* (Paris, 1897); Beaumont, *Report on a Journey to the Diamond Fields of Minas Geraes* (London, 1899); Claremont, "The Cutting and Polishing of Precious Stones," *The Mineral Industry*, vol. viii. (New York, 1900); Williams, *Diamond Mines of South Africa*, 2 vols. (New York, new ed., 1905). Consult also Claremont, in *The Mineral Industry*, vol. vii. (New York, 1899). See GEMS; CARBON.

DIAMOND or DYAMOND. In Spenser's *Faerie Queene*, one of the three sons of Agape, who is killed by Camballo, and who miraculously bequeaths his strength to his two brothers.

DIAMOND, CAPE. See CAPE DIAMOND.

DIAMOND BEETLE. The common name of a South American weevil (*Entimus imperialis*), so named because of its brilliant coloration. It is an inch or more in length, with a black surface covered with punctures lined with oval scales that reflect such a brilliant green that the entire elytra appear green instead of black. The color changes with varying reflected light, and is purely optical and not due at all to any pigment.

DIAMOND-BIRD (so called from the peculiar marks on the plumage). A small insectivorous bird of the Australian genus Pardolotus, of uncertain affinities, but allied to the honeysuckers (q.v.), and by some placed in the Dicæidæ. (See DICÆUM.) The commonest species is the well-known *Pardolotus affinis*. "It would be in vain," says Wheelwright, in *Bush Wanderings* (London, 1865), "to attempt to do justice . . . to the varied and beautiful plumage of this handsome little bird. The general color is ashy-gray and white, but spotted and spangled all over with red, yellow, orange, and black, and the tail-coverts dark red." It is migratory, frequents in summer the open gum forests of southern Australia, especially about the honeysuckles and other tree-flowers; has a loud, sweet call-note; and breeds in holes in old logs and sometimes in the ground.

DIAMOND-CUTTING. See DIAMOND; LAPIDARY WORK.

DIAMOND NECKLACE, THE AFFAIR OF THE. A celebrated scandal involving the royal family of France in the years preceding the outbreak of the French Revolution. The affair has remained a puzzling incident in the history of the French Court, in spite of time and a fairly generous literature. The nearest approach to the truth has probably been made by Michelet, in the sixteenth volume of his *Histoire de France*. The story revolves about a magnificent collar of diamonds which Messrs. Boehmer and Bassange, jewelers to the French Court, had brought together at vast expense for Madame du Barry, mistress of Louis XV. The King, however, died before the necklace was completed. Toward the end of 1784 Boehmer and Bassange attempted to induce Marie Antoinette to purchase the necklace, through the efforts of an intermediary, a certain Countess Lamotte-Valois, who claimed descent from the house that had once ruled over France, and who enjoyed some influence with the Queen. For some time before this the Countess had been acting as the agent in a remarkable intrigue revolving about Cardinal Rohan, Grand Almoner of France and Bishop of Strassburg, who, previous to 1774, had been ambassador at Vienna, and had been recalled in disgrace. Hoping to regain power through the favor of the Queen, this good-natured libertine, generous, vain, and easily imposed upon, fell a victim to the cunning of the Countess, who persuaded him that Marie Antoinette was inclined to look with favor upon him. A remarkable correspondence ensued, in which Rohan's hopes were fed by letters purporting to come from the Queen, but in reality written by the Countess. In July, 1784, the Cardinal was made to believe that the Queen had consented to give him a private audience. A woman of the streets, a certain Mlle. Oliva, in form and general cast of features remarkably resembling Marie Antoinette, was hired to impersonate the Queen. A brief interview in the park of Versailles at midnight served to keep up the prelate's ardor, and his gratitude showed itself in substantial favors to the Countess.

When Boehmer and Bassange sought her services with the Queen, the Countess probably conceived the idea of uniting the two enterprises into one profitable undertaking. In January, 1785, she informed Bassange that the Queen was willing to purchase the collar, but she made it a condition that the negotiations must be carried on through a third person. Rohan was designated as the one from whom the jewelers were to take their sureties as to payment. The Cardinal, who had been persuaded that his services in the matter would insure his success with the Queen, agreed to pay 1,600,000 livres for the necklace in four installments, beginning with August 1. On January 29 the jewelers signed a contract of sale, and on the 31st the instrument was returned to them signed 'Marie Antoinette de France.' This is generally brought forward as a proof against the genuineness of the signature, inasmuch as the Queen was accustomed to sign herself 'Marie Antoinette d'Autriche.' On February 1, at Versailles, in the presence of Rohan, the Countess delivered a casket containing the necklace to Desclaux, an attendant of the Queen, after the smaller stones and pendants had been removed for the purpose of securing the money necessary for the payment of the first installment. This is the version given by the Countess in her *Memoirs*, and is accepted by Michelet. Whether the account be true or false, nothing more was ever seen of the collar as a whole. The failure of Rohan to pay on August 1 led the jewelers to complain to Breteuil, Minister of Police, who, as an enemy of Rohan, rejoiced exceedingly, and informed the Queen of the scandalous reports which were being circulated in Paris concerning the Cardinal and herself. The affair was quickly brought to the notice of the King, upon whom it produced an extremely painful impression. On August 15, Ascension Day, the Cardinal Rohan, in full pontifical robes, was arrested in the midst of the Court, and sent to the Bastille. The Countess was arrested three days later, and this was followed by the imprisonment of the wonder-working magician Cagliostro (q.v.), who had been Rohan's chief adviser in the affair, as well as of Lamotte's lover and Mlle. Oliva. The Parlement of Paris was charged with the trial of the case, which, however, was conducted in a half-hearted manner, for it would seem that the King, fearing the odium which a full revelation might bring upon the Queen, prevented, in a large measure, an impartial investigation. On May 31 the

Countess was found guilty of the theft of the necklace, and was sentenced to be scourged, branded, and imprisoned for life. Her husband, who had succeeded in avoiding arrest, was condemned to the galleys as her accomplice. Rohan and Cagliostro were found guilty of criminal intent, and the Cardinal was declared an innocent dupe. The Countess succeeded in escaping from prison, and took up her residence in London, where she died miserably in 1791.

From the evidence adduced during the trial, from the conduct of the principal characters after the revelation, and from a comparison of the Memoirs subsequently published by the Countess Lamotte, and by Georgel, the private secretary of Rohan, Michelet was led to believe that the Countess's account of the disappearance of the necklace is, on the whole, the most reasonable. Against Rohan, who declared that the jewels had been stolen by the Countess and disposed of in London by her husband, she maintained that only the smaller stones had been removed and sold in London, and that the proceeds of the sale had been spent by Rohan and his suite. The larger stones, she insisted, had been delivered in good faith to the Queen's messenger, and if they were intercepted, it must have been done by Rohan himself. In so far as regards the Queen, Michelet believes that she was a party to the intrigue with Rohan, into which she entered, probably, out of a well-known predilection for risqué escapades. He hints, also, that the Queen in fact did receive the jewels, but that the Countess was condemned and Rohan exculpated to save Marie Antoinette's good name. The Affair of the Diamond Necklace played no small part in hastening the approach of the French Revolution by bringing the monarchy and the Court into greater disrepute than ever. The populace of Paris seized upon the occasion to vent their hatred against the Austrian woman. The Parlement itself was by no means unwilling to condemn the Countess Lamotte, since, in doing so, it was virtually striking at the Queen, whose agent, according to popular opinion, she was. Consult: Michelet, *Histoire de France*, vol. xvi. (Paris, 1867); Carlyle, *The Diamond Necklace;* Campardon, *Marie Antoinette et le procès du collier* (Paris, 1862); Combes, *Marie Antoinette et l'intrigue du collier* (Paris, 1776). The so-called *Memoirs* of the Countess Lamotte, published in London in 1791, are valuable, though requiring to be used with the utmost caution. The *Memoirs* of Georgel, Campan, and Beugnot are also important sources of information. The best account of the whole affair is to be found in Funck-Brentano, *The Diamond Necklace* (Eng. trans., New York, 1901).

DIAMOND RATTLESNAKE. See RATTLESNAKE.

DIAMOND-SNAKE (so called from the diamond-shaped marks on its skin). (1) An Australian python, or rock-snake (*Python spilotis*), which was long regarded as one of the two species of the genus Morelia, the other being the so-called carpet-snake (*Morelia variegata*). The two are now considered varieties of a single highly variable species of true python, the richly colored variety called diamond-snake being especially abundant in Victoria, while the so-called carpet-snake is widely scattered throughout Australia. It is about six feet long, of rather heavy form, and inhabits nearly every region that offers shelter, though stony ridges supplied with trees and well watered seem to be its favorite haunt. Its food consists of small mammals, birds, and birds' eggs and young, and it frequently raids the poultry yards of the farmers. Though able to bite severely when irritated, it is not poisonous. It makes a sort of nest of dry grass or other soft materials within a hollow log, or similar place, and lays its eggs in a pile, which it guards. The colors vary from glossy black, with bright yellow spots, one on each scale, and forming an arrangement of lozenge-shaped markings, with the abdomen yellow and black, as in the true diamond-snake, to the greenish, irregularly marked coloration of the 'carpet' variety.

(2) In Tasmania, a local venomous serpent (*Holocephalus superbus*). See DEATH-ADDER.

DIAMOND STATE, THE. Delaware. See STATES, POPULAR NAMES OF.

DIAMOND WEDDING. See WEDDING ANNIVERSARIES.

DIA'NA (Lat., OLat. *Jana*, fem. of *Janus*, probably connected with Lat. *Jupiter*, Gk. Διός, *Dios*, of Zeus, Skt. *div*, sky). A Roman goddess, corresponding in most of her attributes to the Greek Artemis. According to the common myths, she was the daughter of Zeus and Leto, the twin sister of Apollo, and therefore worshiped with him at Delos, Miletus, and many other places. There seems good reason for believing that this connection with Apollo is one of the later developments of the worship of Artemis. It exercised, in time, a powerful influence on literature, art, and religion. To this aspect of Artemis belongs the conception of her virgin purity, a quality which she was supposed to require strictly from others, especially from her priests and priestesses. From the fifth century B.C., Artemis is frequently identified by the poets with Selene, the moon-goddess, and Hecate, while still later she was connected with numerous foreign deities, in whose worship the Greeks thought they found kindred rites. Such were the Persian Anaïtis from the Oxus, the Thracian Bendis, the Cretan Britomartis or Dictynna, the goddess of the Tauric Chersonese (the Crimea), who was worshiped with human sacrifices, and, above all, the great nature-goddess who was the chief deity of Ephesus, where her temple was the wonder of the world. In archaic art, Artemis often appears as winged and grasping two lions or other wild animals, the so-called 'Persian Artemis'; but later the prevailing type is that of the huntress, with high-girded tunic, armed with bow and quiver, and sometimes grasping a deer. She also appears in long, flowing robes, and, as Selene, wears the crescent moon on her forehead. The Romans identified with the Greek Artemis their Italian goddess Diana, who was also a nature-goddess. Her worship was rapidly Hellenized, but the cult in the grove at Nemi (q.v.) was long preserved. The distinguishing feature of this sanctuary was that the priest must win his position by killing his predecessor; a requirement which in historic times led to this place being filled with runaway slaves. Consult Frazer, *Golden Bough* (3 vols., London, 1900).

The conception of this goddess is singularly devoid of unity, and there is much in the legends and cults which suggests the union under a common name of originally diverse local divinities. Even the Greek name is still unexplained. In many phases of her cult, Artemis appears as a nature-goddess, as bringing fruitfulness, and as worshiped on mountains and in meadows or sacred groves, or even as connected with the swamps and streams, or with husbandry. More prominent in the literature and art is the conception of Artemis as ruler and guardian of the animal world, not merely of deer, bear, and other wild creatures, but also of domestic cattle, for the bull is one of her chosen victims, and the bucolic poetry of the shepherds is said to have arisen at her festivals. Artemis (sometimes directly identified with Eileithyia) was supposed to protect women in childbirth; she also watched over the growth of children. To her they offered their hair on attaining maturity, and the maidens, before marriage, dedicated their toys, dolls, and garments. But Artemis does not always appear as the friendly deity. She is also a goddess of death, especially in the case of women, whom she slays with her gentle arrows as Apollo does men. In this aspect, she demanded human sacrifices, and there are numerous traces of such bloody rites in such Greek legends as that of Iphigenia, and in later symbolism. See MYTH; MYTHOLOGY.

DIANA. (1) In D'Urfé's *Astrée*, a character suggested by Montemayor's *Diana Enamorada*. (2) In Shakespeare's *All's Well that Ends Well*, the daughter of the widow, who, through Bertram's love for her, reconciles him with Helena.

DIANA, TEMPLE OF. A magnificent structure at Ephesus, built at the public charge, and recorded as one of the seven wonders of the world. The site was early the seat of the worship of the Asiatic nature-goddess, whom the Greeks identified with Artemis, and legend told of many temples burned before the Ephesians, in the sixth century B.C., began the earlier of the two famous temples. Chersiphron, of Cnosus, was the chief architect, and the work was continued by his son Metagenes. According to Pliny, 120 years elapsed before it was completed, but the statement is somewhat doubtful, as it seems clear that the sculptured bases of the columns and the frieze and cornice belong to the same era, the time of King Crœsus (q.v.), who contributed largely to the building. This temple was burned in B.C. 356 by a certain Herostratus, who wished to immortalize himself; and the myth-mongers asserted that the fire occurred on the night when Alexander the Great was born. The fire seems to have destroyed only a part of the temple, and its reconstruction was at once begun, under the direction of Dinocrates (q.v.). This temple seems to have been plundered and perhaps burned by the Goths in A.D. 262. Of these structures, some remains were found by J. T. Wood, who conducted excavations at Ephesus from 1863 to 1874, though not till 1869 was the true site determined. The lower platform was 418 feet 1½ inches by 239 feet 4½ inches, while the top of the stylobate measured 342 feet 6½ inches by 163 feet 9½ inches. This was 10 feet 10½ inches above the lower platform. The temple had two rows of eight columns each across the front, and probably two rows of 20 columns each on the sides, counting corner columns twice. The columns were about 60 feet high, of the Ionic order, and 36 of them had the lower drums sculptured in relief. The sculptures and fragments of the architecture of both the earlier and later temples are now in the British Museum. The material hardly suffices for a satisfactory restoration, and the schemes proposed differ widely in details. Consult: Wood, *Discoveries at Ephesus* (London, 1877); Ferguson, "The Temple of Diana at Ephesus," in *Transactions of Royal Institute of British Architects* (London, 1883); and Murray, "Sculptured Columns of the Temple of Diana at Ephesus," in *Journal of the Royal Institute of British Architects* (London, 1895).

DIANA AND ACTÆ'ON. A painting by Titian (1559), now hanging in Bridgewater House, London. It represents the goddess surprised by the hunter, in the midst of her ablutions.

DIANA AND CALLIS'TO. A mythological picture by Titian, in the Bridgewater collection. It represents the detection of the Arcadian huntress's shame.

DIANA ENAMORADA, dē-ä'nȧ ā'nȧ-mō-rä'ᴅȧ (Sp., enamored Diana). An extremely popular pastoral romance, by Jorge de Montemayor, first printed at Valencia in 1542; left incomplete, and finished in 1564 by Antonio Perez of Salamanca.

DIANA MONKEY. A well-known monkey (*Cercopithecus Diana*) of the west coast of Africa, which takes its name from a crescent of upstanding white hair on the forehead. Its general color is black, with the ridge of the back and the rump bay color, sharply defined and strikingly set off by the pure white of all the fore parts, including a long beard. Like its congener, the Mona monkey, this guenon (q.v.) is gentle and easily tamed when young; but it is rarely seen in menageries on account of its delicacy. See Plate of MONKEYS OF THE OLD WORLD.

DIANA OF VERSAILLES, vĕr-sälz'. The most celebrated extant statue of Artemis, from Hadrian's villa at Tivoli, now in the Louvre. The huntress is shown stepping quickly forward and about to draw an arrow from the quiver.

DIANA WITH HER NYMPHS. A famous painting by Domenichino, in the Borghese Gallery, Rome. It represents the huntresses of Greek myth returning with the spoils of the chase.

DIANE DE FRANCE, dē'än' de fräɴs, DUCHESSE DE MONTMORENCY ET D'ANGOULÊME (1538-1619). A French lady, born in Piedmont. Her father was Henry II. of France and her mother, Fillipa Duca, a low-born Piedmontese of great beauty, whom he met during the campaign in Italy (1537). Diane was educated in France and solemnly legitimatized, and always afterwards signed herself Diane de France. She was the favorite daughter of her father, and was married with much pomp to Orazio Farnese, Duc de Castro, second son of the Duke of Parma (1553). Six months later this prince was killed by the Spanish at Hesdin. Four years afterwards Diane was married to François de Montmorency, the eldest son of the Constable. Upon his death she declined to enter again into matrimony, and turned her attention to pious deeds and the delicate rôle of mediator in the differences between the members of her family. Her gentleness and real goodness, in a time so corrupt, made her honored by all. She is one of the most agreeable figures in that period of French history.

DIANE DE POITIERS, dḗ'ȧn' de pwă'tyȧ' (1499-1566). Duchess of Valentinois and mistress of Henry II. of France. When but thirteen years of age she was married to the Count of Maulevrier, Grand Seneschal of Normandy, by whom she had two daughters. She was a widow at thirty-two, and some seven years later became the mistress of Henry (then dauphin), who was but eighteen years old. At that time the Duchess d'Etampes was the favorite of Francis I., and the two women ruled the Court; but when Henry became King, Diane was the real ruler, and at once sent her rival into exile. Notwithstanding the beauty and the rights of his wife, Catharine de' Medici, Henry was controlled by Diane during his whole reign. Between Catharine and Diane, however, friendship and a mutual understanding prevailed. After the death of Henry she disappeared from public sight.

DIANO MARINA, dê-ä'nô mȧ-rē'nȧ. A winter resort, with sea-bathing, in the Province of Porto Maurizio, northwest Italy, 20 miles east of San Remo (Map: Italy, C 4). It was partly destroyed by the earthquake of February, 1887, but has since been rebuilt. Population (commune), in 1901, 1859.

DIANORA, dē'ȧ-nŏ'rȧ. The wife of Gilberto in the fifth story of the tenth day in Boccaccio's *Decameron*. To free herself from the suit of Ansaldo she set him an impossible task, which, however, he accomplished by the aid of a magician. When her husband insisted on her carrying out her promise, Ansaldo waived his claim. The story is the source of Chaucer's *Franklyn's Tale*.

DIAN'THUS. See CARNATION; PINK.

DI'APA'SON (Lat., octave, from Gk. *διαπασῶν*, *diapasōn*, through all, sc. *χορδῶν*, *chordōn*, chords). A term in music by which the ancient Greeks designated the octave. In modern music, diapason is used to denote the range or compass of the voice or of an instrument. The French used the term as equivalent to *pitch*. The diapason normal is the standard or international pitch which is now almost universally adopted. The French Academy, in 1859, fixed the number of vibrations of the a^1 at 870 (or 435 double vibrations) per second. Diapason is also the English name given to certain stops of pipes in the organ, commonly of eight-foot pitch, which are considered the fundamental stops, of which there are generally two—a stopped diapason and an open diapason—on each manual. See ORGAN.

DIAPER (OF. *diapre*, *diaspre*, It. *diaspro*, from Lat. *jaspis*, Gk. *ἴασπις*, *iaspis*, jasper, possibly of Semitic origin; cf. Heb. *yāshpheh*, Ar. *yCsb*, *yasf*, *yashb*, jasper; this stone being much used in ornamenting jewelry, originated the name of a texture ornamented or variegated in an analogous way). In textile manufactures this term is applied to fabrics woven like damask (q.v.), but with the pattern of a checkered character. The appellation, originally given to silk, is now given to any material woven in this way. In architecture, DIAPER-WORK, or DIAPERING, is a kind of decoration applied to plane surfaces, and consists of a small pattern either of flowers, leaves, or arabesques, carved or painted. The flower, or other object, is generally inclosed in a small frame, and these frames, which touch each other at the edges, constitute in themselves a sort of mathematical diapering. When the pattern is carved, it is generally sunk; and when painted it consists of a darker shade of the same color as the plane surface, by which the effect of shadow is communicated to it.

DIAPRÉ is applied in heraldry to fields and charges, relieved by arabesque and geometrical patterns. These patterns were generally of a darker shade of the same tincture. This, being merely an ornamental device, not affecting the heraldic value of the objects to which it was applied, was generally left to the fancy of the painter.

DI'APHAN'OSCOPE (Gk. *διαφανής*, *diaphanēs*, transparent + *σκοπεῖν*, *skopein*, to see). A dark box, constructed for exhibiting transparent photographs or other pictures. It may or may not be furnished with a lens. The photograph, which is generally a glass positive, is placed at a distance from the eye equivalent to the focal length of the lens with which the original picture was made.

DI'APHORE'SIS (Lat., from Gk. *διαφόρησις*, perspiration, from *διαφορεῖν*, *diaphorein*, to carry off, from *διά*, *dia*, through + *φορεῖν*, *phorein*, to carry, frequentative of *φέρειν*, *pherein*, to bear). The excretion of sweat or perspiration, whether perceptible or not. The term is generally used to denote the excessive perspiration caused by certain drugs called diaphoretics (q.v.) or sudorifics.

DIAPH'ORET'ICS (Gk. *διαφορητικός*, *diaphorētikos*, promoting perspiration, from *διαφορεῖν*, *diaphorein*, to carry off). Remedies used to excite the secretions of the skin. The simplest diaphoretic agents are baths, which may be either warm baths of water or vapor baths, and may be either simple or medicated. (See BATH.) The most powerful of all, however, as regards inducing perspiration, is probably the so-called Turkish bath, which consists essentially in the use of air heated to a temperature of 140° F., or even more. The following substances, used internally, are powerful diaphoretics: antimony, ipecacuanha, opium (these three either singly or in combination); ammonia, and the carbonate, or acetate, of ammonia (spirit of Mindererus), sweet spirits of nitre, pilocarpine, and alcohol.

DIAPHRAGM (Lat., *diaphragma*, Gk.. *διάφραγμα*, partition, midriff, from *διαφραγνύναι*, *diaphragnynai*, to barricade, from *διά*, *dia*, through + *φραγνύναι*, *phragnynai*, to fence in). A thin musculo-fibrous partition separating the cavity of the thorax from that of the abdomen. It is roughly elliptical, with the longest diameter from side to side and almost horizontal in its anterior part, while the posterior portion is nearly vertical. The diaphragm is attached in front to the ensiform cartilage of the breast-bone (sternum), and laterally to the inner surface of the cartilages and bony parts of the six or seven lower ribs; posteriorly the attachment is to two aponeurotic arches on each side (*ligamentum arcuatum externum* and *internum*), and to the second, third, and fourth lumbar vertebræ by means of firm fibrous tendons (the crura of the diaphragm), which terminate above in large fleshy bellies. The central portion of the diaphragm is tendinous and shaped like a trefoil leaf, the muscular fibres radiating from this to the points of attachment. There are three large and several smaller openings in the diaphragm. Through the former pass the abdominal aorta, the vena azygos major, the thoracic duct, the œsophagus, pneumogastric nerves, and vena cava. The diaphragm is convex above and is in relation with the pleuræ of the lungs and pericardium; while its concave dome is invested by the peritoneal lining of the abdomen. During respiration the height of the diaphragm constantly changes; it descends during inspiration and thus increases the capacity of the thorax, so that air rushes in to fill the vacuum formed. This contraction of the diaphragm also raises the ribs and widens the chest laterally. In expiration the diaphragm returns to its former position. The descent of the diaphragm encroaches upon the abdomen and lessens its capacity. In all expulsive acts the diaphragm by its contractions gives increased power to the effort and is accordingly an important factor in sneezing, coughing, laughing, and crying, as well as in the expulsion of urine and fæces. Hiccoughing is due to spasmodic contraction of the diaphragm.

DIAPHRAGM. A partition with a hole in it, employed, not only in landscape and portrait lenses for photography, but also in telescopes, microscopes, and other optical instruments, for the purpose of cutting off the superfluous rays of light, and producing greater intensity or sharpness of the image by decreasing the amount of spherical aberration. (See ABERRATION, SPHERICAL.) The diaphragm only permits those rays to pass which go through the central portion of the lens. The aberration of these rays is much less than those which pass through the lens nearer its circumference.

DIARBEKIR, dē-är'be-kēr', or **DIARBEKR**, dē-är-bĕk'r. A town of Asiatic Turkey, capital of a vilayet of the same name, situated near the right bank of the Tigris, from which it is separated by extensive gardens (Map: Turkey in Asia, J 4). It is circular in shape, and is surrounded by high, strong walls, flanked with towers and pierced by four gates. The streets are dirty, and the houses for the most part are built of rough stone, plastered with a composition of mud and straw, but some of the better class are of black basalt. It has numerous handsome mosques, khans, and bazaars, and several Christian churches. Extensive manufactures of silk, cotton, and other goods were at one time carried on at Diarbekir, and the trade between Aleppo and Bagdad contributed greatly to the importance of the town, but the manufactures and trade have now greatly declined. Its present manufactures consist of red and yellow morocco, silk, and copper ware. Diarbekir occupies the site of the ancient Amida, which was a place of importance in the reign of Constantius, by whom it was strengthened and enlarged. In this reign it was taken by the Persians, from whom it was again captured by the Romans; but in 502 the Persians once more became masters. After many vicissitudes it passed into the hands of Sultan Selim in 1515. Its population is estimated at 47,000, chiefly Mohammedans.

DIARRHŒA (Lat. *diarrhœa*, from Gk. *διάῤῥοια*, *diarrhoia*, a flowing through, from *διάῤῥεῖν*, *diarrhein*, to flow through, from *διά*, *dia*, through + *ῥεῖν*, *rhein*, to flow). A symptom of many diseases, consisting in frequent fluid discharges from the bowels. It occurs in catarrhal or inflammatory diseases of the various parts of the bowels, as enteritis, colitis, and duodenitis, in cholera, typhoid fever, Bright's disease, dysentery, and tuberculosis. It is often a temporary affection, due to an effort of nature to remove poisonous or indigestible substances from the intestine. It follows the use of purgative medicines, as is intended. It sometimes occurs in wasting diseases, from the relaxed condition of the blood-vessels of the intestines, whereby the water of the blood soaks through and escapes with the fæces. Pain, some weakness, and soreness accompany it in most cases. The treatment must be directed, as usual, to removing the cause. If the diarrhœa is caused by indigestibles, a cathartic like castor-oil or rhubarb should be used, and very little simple food should be given for a day afterwards. In other cases carminative and astringent drugs are used, such as ginger, catechu, cardamom, bismuth, chalk, or boiled flour. Opium, lead, iron, capsicum, and camphor are sometimes prescribed. Before using drugs it is, however, necessary to determine, in all but simple cases, whether the diarrhœa is beneficial and therefore should not be checked. See CHOLERA.

DIARY (Lat. *diarium*, from *dies*, day). A word which means simply a daily record. It does not, however, comprehend every sort of daily record, but only such as have reference to the writer personally. In it the man of letters inscribes the daily results of observation, reading, or thought; to the business man it serves the purpose of an order or day book; while the physician finds it indispensable as a register of engagements. The usual diary is a book with a separate blank space for each day in the year, these spaces varying in size and form, as the particular bent or profession of the diarist may render necessary. It usually contains some general information, especially a calendar. Some men, however, use any convenient blank book. The Greeks had the diary, which they called the *ephemeris* (meaning 'of the day'). This word in its plural form, *ephemerides*, has been adopted by some scholars; it is the name that Casaubon gave to the records of his daily studies. The word *journal* is also in use; we have, for example, the *Journal of Sir Walter Scott*. Diaries have often furnished the historian with invaluable material, supplying the absence of public records, and furnishing minute and graphic details of the social condition and the secret springs of public events that are not to be looked for in more formal records. Perhaps the most notable in this respect are the diaries of Evelyn and Pepys (q.v.).

DIAS, dē'ās, BARTHOLOMEU (?-1500). A Portuguese navigator and the discoverer of the Cape of Good Hope. He came of a family of famous sailors. JOÃO DIAS was associated with Gil Eannes in the voyage of 1434, when Cape Bojador was first doubled, and DINIZ DIAS was the discoverer of Cape Verde in 1445. BARTHOLOMEU DIAS DE NOVAES made a voyage to Guinea for ivory and slaves in 1478, and in 1481 he was in command of a vessel sailing to the Gold Coast. Dias was a cavalier of the King's household and superintendent of the royal warehouses when, in October, 1486, King John of Portugal selected him to bear a message to Prester John by sailing around Africa. After several months of preparation Dias sailed for the south in the early summer of 1487 with three vessels. One, a slave vessel, was left at a harbor near the limit of previous exploration, and then Dias began his long voyage along the unknown African coast, to a part of which he gave the expressive name of 'Hell.' Just after New Year's Day, 1488, he was caught by a storm which drove him southward for thirteen days, until his crews, fresh from the tropics, began to suffer from the cold. As soon as the storm subsided Dias steered eastward, but, not meeting with land for several days, he turned his prow northward. After sailing 150 leagues he sighted high mountains, and anchored, February 3, 1488, in the modern Mossel Bay, in Cape Colony. Finding that the coast ran east and west, he followed it to Algoa Bay, where the coast began to trend more toward the northeast. Dias proceeded as far as the mouth of the Great Fish River, but was induced by the complaints of his sailors to turn back. It was probably on May 16 that he passed Cape Agulhas, the actual southernmost point of Africa, and a day or two later he saw the striking Table Mountain and the cape which he is commonly said to have named Cabo Tormentoso (Cape of Storms), in memory of the perilous experiences with which it was associated, but which the Portuguese King rechristened Cabo da Bõa Esperança, the Cape of Good Hope, though, according to Christopher Columbus, who was present at the royal interview, Dias himself proposed the name. In December Dias reached home, with the news that the point of Africa had been turned, and that the way lay open toward the spice markets of the East. He had added 1200 miles of coast to the knowledge of European sailors and geographers. Between 1490 and 1495 Dias was in command of a vessel engaged in the African trade. When, in 1497, Vasco da Gama was dispatched to complete Dias's discovery of the way to the East, the latter accompanied him as far as the Cape Verde Islands, and thence sailed to the Gold Coast to trade. Three years later he commanded one of the ships in Cabral's fleet. Leaving Brazil in May, 1500, Dias perished in a storm which wrecked his vessel. Consult E. J. Ravenstein, "Voyages of Cão and Dias," *London Geographical Journal* (1900).

DIAS, dē′ăsh, GONÇALVES ANTONIO (1823-66). A Brazilian poet, born at Caxias. He was educated at the university of Coimbra, Portugal, and for a time practiced law at Maranhão, Brazil. He was afterwards professor of history in the College of Dom Pedro II. at Rio de Janeiro. His works include a report, *Brazil e Oceania;* several papers of value on the migrations of the South American Indian tribes; and a number of volumes of poetry, among them the series *Primeiros Cantos* (1846), *Segundos Cantos* (1848), and *Ultimos Cantos.*

DIAS, HENRIQUE (?-1661). A Brazilian soldier of African blood, born in Pernambuco. He fought with the Portuguese against the Dutch under Gen. Matias de Albuquerque (1633), and did valuable service. He defended Arraial do Bom Jesus, and upon its fall was permitted by the Dutch to escape, and rejoined the Portuguese army. His brave conduct caused him to be made commander-in-chief of the negro forces, and he was rewarded with the cross of the Order of Christ. In 1645 he rose against the Spaniards, and incited the districts of Sergipe, São Francisco, and Alagoas to revolt. For the next ten years he fought continuously, but after the Dutch and independent Spaniards were beaten, Dias was not remembered and promoted with the other generals who fought in Pernambuco. He died in poverty, although his name has always been given to a negro regiment commanded by one of its own race.

DI′ASPORE (Gk. *διασπορά, diaspora*, a scattering, from *διασπείρειν, diaspeirein*, to scatter, from *διά, dia*, through + *σπείρειν, speirein*, to scatter). A hydrated aluminum oxide that crystallizes in the orthorhombic system, is transparent to translucent, and usually white or light gray, though sometimes of a brownish or yellowish color. It occurs with corundum and emery in dolomite and chlorite schist. This mineral is found in granular limestone with emery, in the Ural region, in Hungary, Sweden, Asia Minor, and in the United States at the emery-mines of Chester, Mass., where it occurs in large plates in crystals, and is also found with massive corundum near Franklin, Macon County, N. C.

DI′ASTASE (Gk. *διάστασις, diastasis*, separation, from *διιστάναι, diistanai*, to separate, from *διά, dia*, apart + *ιστάναι, histanai*, to stand). An enzyme found in both animals and plants, which has the power of converting starch into a sugar. It has also been called amylase, and in the saliva is known as ptyalin. In plants, where it is practically universal, diastase occurs in two modifications, which have their parallels also in animals, viz. secretion diastase and translocation diastase. These differ in their distribution, their mode of action on starch-grains and starch paste, the optimum temperature for activity, etc. Translocation diastase is the more widely distributed of the two, being formed by fungi and bacteria, and in leaves, shoots, storage organs, and pollen-grains, as well as in the seed. Its function seems to be to make possible the translocations of carbohydrate food, temporarily or permanently stored as starch, by digesting it into a soluble sugar. Translocation diastase is therefore of the utmost importance in plant nutrition. Secretion diastase is formed by special secreting cells in the embryo of seeds, especially in grasses, and plays its chief rôle in germination by making available the food stored as starch in the seed. Translocation diastase digests and liquefies starch paste slowly, and erodes starch-grains uniformly at the surface or in the centre until they disappear. Secretion diastase liquefies starch paste rapidly and corrodes starch-grains by forming irregular pits, which, penetrating the grain in various directions, deepen and widen until it falls to pieces. Translocation diastase is most active at 45° to 50° C. (113° to 122° F.), secretion diastase at 50° to 55° C. Both are destroyed at 70° C. (158° F.).

Diastase cannot be obtained in a pure state; and because its composition has not yet been ascertained, no test for purity can be established. It may be obtained by crushing or grinding the tissue containing it, e. g. malt, and extracting it for twenty-four hours with three or four times its bulk of water or weak alcohol. The liquid may be filtered off and the various substances dissolved along with the diastase may be partially eliminated by adding about three volumes of absolute alcohol, collecting on a filter the precipitate formed, washing it with absolute alcohol and ether, and drying. The powder so obtained may be still further purified by solution in water, re-precipitation with alcohol, and dialysis. In the dry state, it may be kept indefinitely, and retains its digestive power.

The action of diastase on starch is one of hydrolysis, i.e. it causes the starch to combine with water and break up into simpler compounds. The intermediate steps in the process are not known. But the ultimate products of the hydrolysis are a variety of sugar called maltose, 80 per cent., and dextrin (q.v.), 20 per cent. Diastase acts most effectively in a weak solution of common salt and carbonic acid, both of which are ordinarily present in plant-cells. The presence of antiseptics, as well as of alkalies, acids, and many salts, has the effect of greatly diminishing and sometimes of altogether destroying the efficacy of the enzyme.

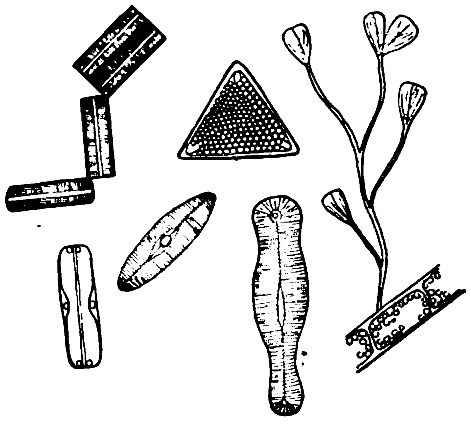
Diastase is largely made use of in the manufacture of beer and alcohol, small quantities of the enzyme being capable of effecting the transformation of a considerable amount of starch. A preparation of diastase has of late also been used with some success in the treatment of fermentative dyspepsia. See ALCOHOL; BEER; DEXTRIN; ENZYMES.

DIAS'TROPHISM. A general term applied to the geological processes which cause the upheaval and subsidence of continental lands and the building of mountain systems. Such processes probably result from the strains produced in the earth's crust in adjusting itself to the nucleus. See GEOLOGY; CONTINENT; MOUNTAIN.

DI'ATHER'MANCY (from διά, *dia*, through + θέρμανσις, *thermansis*, a heating. A term used to express that quality of a body in virtue of which those ether-waves are allowed to pass which produce thermal effects to a marked degree. All ether-waves carry energy; and in many cases when these waves are absorbed their energy is spent in producing heat effects. (This is not so, when the energy of the waves goes to chemical or electrical action.) It is found that in the spectrum of ether-waves emitted by any body, e.g., the sun, the energy carried by waves of different wave-number is in general different; similarly, the transparency of a body to ether-waves varies with their wave-number. In discussing diathermancy, therefore, it is necessary to consider both the total radiation transmitted and also the wave-numbers of these waves. (See RADIATION.) The greater portion of the energy carried from the sun and from other bodies by ether-waves is associated with waves whose wave-numbers are so small that they do not affect our sense of sight; and other instruments have to be used to detect the waves and measure their energy. Such are thermometers, bolometers, etc. It is possible to have bodies which are absolutely opaque to those waves which affect our eyes, and yet are transparent to waves which have a less wave-number; and the converse is true. Lamp black, which is opaque to nearly all radiations has been found to transmit certain heat waves of great length, that is, small wave number. Ebonite is transparent to long wave radiations, so that an ebonite prism spreads some of the radiation from a hot body into an invisible heat spectrum, which is quite sensibly detected by a radio micrometer. The diathermancy of a body depends upon its temperature and upon its thickness. Consult Tyndall, *Heat as a Mode of Motion* (6th ed., London, 1880).

DIATH'ESIS (Neo-Lat., from Gk. διάθεσις, disposition, from διατίθεσθαι, *diatithesthai*, to dispose, from διά, *dia*, apart + τιθέναι, *tithenai*, to place). A word applied in medicine to the predisposition or constitution of the body which renders it prone to certain diseased states. Thus the tubercular, scrofulous, gouty, rheumatic, cancerous, or hemorrhagic diatheses are mentioned. A person with gouty diathesis is one in whose case exposure to cold, eating indigestible food in large quantities, or drinking beer causes gouty pains and increased amount of uric acid in the urine; who is likely to have eczema; whose blood is deficient in hæmoglobin; and whose arteries are inelastic. The study of diathesis is of great importance, as avoidance of disease through choice of occupation and habits is often possible, if predisposition to disease is recognized.

DI'ATOMA'CEÆ (Neo-Lat. nom. pl. from Gk. διατομή, *diatomē*, severance, from διατέμνειν, *diatemnein*, to cut through, from διά, *dia*, through + τέμνειν, *temnein*, to cut). An immense group of unicellular algæ, estimated at 10,000 species. The cells are solitary or united in various ways into colonies that are frequently elaborately branched. Each cell is provided with a siliceous shell in two halves, which fit closely together. These shells, called valves, are exquisitely sculptured and make favorite preparations for the amateur microscopist. Many diatoms have power of movement, although the cells are never provided with cilia. They slide rapidly backward and forward in a way that is not well understood.



DIATOMS.

The structure and distribution of the cell contents in the diatoms suggest the structure of desmids (q.v.), but the color is generally brown ('endochrome'). Owing to certain peculiarities of cell-division, it is necessary that diatoms at certain periods pass into a resting stage, in which the protoplasm prepares for a new period of vegetative activity. This resting stage is called an auxospore. In some cases the cells change directly into auxospores, but in a large proportion of forms the auxospores result from the fusion of the cell contents of two diatoms. This union of protoplasm does not always present the characters of a sexual act, but it is generally believed to be a degenerate form of sexuality.

The diatoms are common in both fresh and salt waters, and constitute one of the chief sources of food-supply for the lower marine and lacustrine animals, and through these for the higher organisms.

Their siliceous skeletons, which fall to the bottom, favor their ready entombment and preservation as fossils, and their lowly organization suggests the hypothesis that their remains may be found in rocks of the Cambrian and Ordovician series, which contain the oldest foraminifera and radiolarians. They are not, however, positively known to occur in rocks of older than Upper Cretaceous age, which contain species that differ little from those now living, and that belong almost entirely to living genera. In Tertiary time they were exceedingly abundant, and in many parts of the world their remains, with little admixture of other materials, form deposits of considerable thickness and economic importance. These deposits constitute an important source of abrasive materials, and the products are known under such names as tripoli, diatomaceous earth (qq.v), Richmond earth, electro-silicon, kieselguhr, etc. These diatom deposits are most common in Miocene rocks of both marine and fresh-water origin. In some rocks particular species of diatoms form the bulk of definite layers; different localities have their peculiar generic assemblages. The majority of Tertiary diatoms are of species still living. Diatoms have been reported as having been found is the ash of English coal burned in Rome, but English investigators, after the most careful search, have failed to detect them at home. See ABRASIVES.

DI'ATOMA'CEOUS or **IN'FUSO'RIAL EARTH** (Ger. *Bergmehl*). A white or grayish powder of extremely fine texture, composed almost entirely of the indestructible siliceous frustules or cell-walls of diatoms. The earth has accumulated in beds of considerable thickness in past geological ages, and such beds are now being found on the bottoms of some fresh-water lakes and on the sea-floor. Owing to the angular nature and hardness of its component particles, diatomaceous earth has valuable abrasive properties; it is also employed as an absorbent in the manufacture of dynamite, and as an insulating material for boilers and steam-pipe coverings. Deposits of diatomaceous earth abound in the Tertiary and Quaternary formations of many countries. In the United States it has been mined in Virginia, Maryland, Connecticut, New York, and in some of the Western States.

DI'ATON'IC SCALE (Lat. *diatonious*, from Gk. διατονικόν, *diatonikon*, from διάτονος, *diatonos*, outstretched, from διατείνειν, *diateinein*, to stretch out, from διά, *dia*, through + τείνειν, *teinein*, to stretch; connected with Lat. *tenuis*, Skt. *tanu*, Ger. *dünn*, Eng. *thin*). This scale in music is one in which there are seven notes in the interval of an octave at intervals given by the ratios

24 : 27 : 30 : 32 : 36 : 40 : 45.

Thus, if a note whose frequency is 240 is taken as the key-note, there will be the following notes in the interval of an octave:

240, 270, 300, 320, 360, 400, 450,

and the octave of 240 will give the next note, 480. The notes in the lower and upper octaves would then be

120, 135, 150, 160, 180, 200, 225, and
480, 540, 600, 640, 720, 800, 900; etc.

It is evident that the ratios of these various notes are the simplest possible. Thus the ratios 1 : 2, 1 : 3, 1 : 4, 2 : 3, 3 : 4, etc., occur. For this reason chords on this scale are in the greatest possible harmony. (See ACOUSTICS.) If, however, music composed with the key-note 240 is transposed to the key 300, the diatonic scale required would be

$300, \frac{27}{24} \times 300, \frac{30}{24} \times 300, \frac{32}{24} \times 300, \frac{36}{24} \times 300,$ etc.;

that is,

300, 337½, 375, 400, 450, etc.

But some of these notes do not occur in the original scale with the key-note 240; and, for this reason, the diatonic scale is unsatisfactory. Other scales are now used, which include a greater number of notes in the interval of the octave. See MUSIC.

DI'ATRIBE (ML. *diatriba*, discussion, Gk. διατριβή, *diatribē*, disputation, from διατρίβειν, *diatribein*, to discuss, from διά, *dia*, through + τρίβειν, *tribein*, to rub). A disputation, or critical exercise. A name originally given to a critical examination of a literary work, and at a later period to a bitter and violent criticism, either written or spoken, on any subject, in any department of literature.

DIAZ, dē'ȧs, PORFIRIO (1830—). A President of Mexico. He was born at Oaxaca, of Spanish parentage, and was studying law in his native town when the war with the United States broke out. Young Diaz entered a militia regiment in 1847 and thenceforth devoted himself to a military career. In 1854 he commanded a battalion under Alvarez in the contest against Santa Anna. Two years later he identified himself with Juarez and the Liberal Party, and in 1861 was elected Deputy to the National Congress. He soon resigned to take the field, and won a victory over the reactionist Marquez at Jalatlaco. During the French intervention he won a high reputation as one of the most skillful and courageous of the patriot leaders. In May, 1863, while directing the defense of Puebla, he was forced to surrender, but escaped shortly after and went to Oaxaca, where he raised a new force and made considerable headway against the French. In February, 1865, he was again captured, but escaped once more, and once more reappeared at the head of an army he had brought together at Oaxaca. He gradually forced the invading troops to adopt the defensive, and after the evacuation of Mexico by the French, he advanced to Puebla and took the city, April 2, 1867. On June 21 he entered the City of Mexico. In the same year he was a candidate for the Presidency against Juarez, but being defeated, withdrew to his estates. He never ceased plotting against the Government, however, and his intrigues occasionally broke out in the form of armed revolts against Juarez and his successor, Lerdo de Tejada. He was twice forced to flee the country—in 1872, and again in 1876. Returning quickly on both occasions. Diaz succeeded in the latter year in defeating his enemies at Tecoac (November 16th). He finally drove Lerdo out and in May, 1877, he became President. Order was restored in a remarkably short time. Diaz soon managed to win the confidence of European investors, the country was opened up, industries were developed, and the modern period of prosperity was firmly established. As the Mexican Constitution provided that no man should hold the office of President for two consecutive terms, General Diaz was succeeded in 1880 by his close personal friend, General Gonzalez. It soon became evident, however, that only one man could win the trust and support of the Mexican people and of the foreign capitalists upon whom the welfare of the nation depended, and so, after Diaz had been again elected President in 1884, the Constitution was amended, in order to provide for his continuance in that office. The forms of election by popular vote have been duly complied with at each recurring period since, but no serious opposition to 'Don Porfirio,' as he is affectionately called by the Mexican populace, has developed.

DIAZ, dē′ȧth, Ruy, rōōê (1503-38). A Spanish soldier, born at Seville, Spain. In 1532 he accompanied the expedition of Diego de Almagro to Peru, participated in the capture of Cuzco (1534) and displayed remarkable skill and courage in his encounters with the Indians. He was subsequently selected by Pizarro to choose the site of a city to serve as the capital of the province, and thus became the founder of Los Reyes (now Lima), the building of which was begun January 18, 1535. He afterwards took an active part in the campaign in Chile and supported the cause of Almagro. He fought against his former commander, Pizarro, and participated in all the principal engagements until the defeat of the royal forces at Salinas (April 26, 1538), where he was killed while trying to escape from the pursuing enemy.

DIAZ DE LA PEÑA, dē′äz′ de lȧ pȧ′nyä′, Narcisse Virgille (1807-76). A French landscape painter, of the Barbison School. He was born in Bordeaux, of Spanish parents. His father having left his family, the lad was supported by his mother's efforts in teaching Spanish and French. She died at Sèvres, near Paris, when he was ten years old, and Narcisse was adopted by a Protestant clergyman of Bellevue. He rambled through wood and dale, acquiring that love of nature which afterwards made him a great landscape painter. In one of these rambles Narcisse was bitten by a viper, which necessitated the amputation of his leg. He was apprenticed to a porcelain-maker at Sèvres, an uncle of Dupré, who worked there and became his stanch friend. This work, no doubt, helped to develop his wonderful sense of color, but Diaz was too independent a genius to become a porcelain-painter. While studying painting he lived in great poverty in Paris, even having to beg. François Souchon, an historical painter, was his teacher, but Diaz was much attracted by the works of Correggio in the Louvre, and seems also to have been influenced by Leonardo and Prudhon. But he always went his own way, and was in the main self-taught. An unexpected sale of his "Descent of the Gypsies" for 1500 francs in 1836 enabled him to go to Barbison. There he came under the influence of Rousseau and devoted himself to landscape painting, producing the best of his works. He continually exhibited at the Salon, receiving medals in 1844, 1846, and 1848, and the Cross of the Legion of Honor in 1851. He was very prolific, and as his pictures sold well, he became quite wealthy. He was fond of life, and in his magnificent studio in Paris he dispensed great hospitality. He died at Mentone, November 18, 1876, in consequence of a cold taken at the opera.

Diaz was a man of unusual gifts, but he lacked the application and perseverance essential to a genius of the very first order. His pictures were always bright in color, brilliant in execution, and of a striking originality, but his drawing was often weak. His landscapes are usually 'tree-scapes,' showing the play of light and shade among forest trees. He peoples them with nymphs, cupids, Oriental women in gaudy clothes, gypsies, and the like. He loved the summer with its bright sunshine, and especially excelled in depicting rich autumn tints. The greatest number of his works has remained in France, but there are many in the public and private collections of America. The Louvre possesses his "Gipsies" and other works. There are also examples in the Metropolitan Museum, New York; an excellent example being the "Forest of Fontainbleau," in the Vanderbilt collection. Among his chief works are: "Love Disarmed" (1851); "Venus and Cupid"; "A Road in the Forest"; "Hounds in the Forest"; "A Storm." Consult: Muther, *History of Modern Painting* (London, 1896); Hoeber, "Diaz," in Van Dyke, *Modern French Masters* (New York, 1896); Hustin, "Diaz," in *Les artistes célèbres*, and the authorities cited under Barbizon School.

DIAZ DEL CASTILLO, dē′ȧth dĕl kȧ-stē′lyō, Bernal (c.1498-1593). A Spanish soldier and author, born at Medina del Campo. He accompanied Cortés to Mexico in 1519, and after the conquest settled in that country. His *History of the Conquest of New Spain* (3 vols., 1632) is important because narrated by an eye-witness. The style of it, however, is far from elegant. See *Memoirs of Bernal Diaz del Castillo*, by himself, and translated by J. Ingraham Lockhart, 1844.

DIAZ DE PINEDA, dȧ pē-nä′dȧ, Gonzalo (? -1545). A Spanish soldier in Peru, born in Torrelavega. In 1531 he accompanied Francisco Pizarro on the latter's final expedition to Peru, in 1535 explored the Magdalena River to its mouth, in 1536 discovered the country of the Canelos Indians, and in 1540 went with Gonzalo Pizarro on the ill-fated expedition for the conquest of that region. Sent with a small band in an unsuccessful search for Orellana, who had been despatched down the Napo River for supplies, he returned to assist them at last in reaching Peru with a half-starved remnant of the expedition. When, in 1544, Gonzalo Pizarro rebelled against the Viceroy, Nuñez de Vela, he at first sided with the latter, but subsequently joined Pizarro. Defeated by the Viceroy at Colliquén, he escaped, but died from the mistaken use of poisonous plants for food.

DIAZ DE SOLIS, sō-lēs′. See Solis.

DI′AZEUC′TIC TONE (Gk. διαζευκτικός, *diazeuktikos*, disjunctive, from διαζευγνύναι, *diazeugnynai*, to disjoin, from διά, *dia*, apart + ζευγνύναι, *zeugnynai*, to join). In Greek music, that tone which separates the tetrachords (q.v.) of the three oldest modes. In the Dorian mode the diazeuctic tone was the step from b to a. In the later modes the tetrachords were constructed so that the lowest tone of the higher tetrachord was at the same time the highest tone of the lower tetrachord. Then the diazeuctic tone was either above the highest or below the lowest tetrachord. (See GREEK MUSIC.) In the following modes the diazeuctic tone is marked +:

$$\text{Dorian}\quad \overbrace{e^1\text{—}d^1\text{—}c^1\text{—}b}\overset{+}{\text{—}}\overbrace{a\text{—}g\text{—}f\text{—}e}.$$

$$\text{Æolian}\quad \overbrace{a\text{—}g\text{—}f\text{—}e}\overbrace{\text{—}d\text{—}c\text{—}B}\overset{+}{\text{—}}A.$$

$$\text{Mixolydian}\quad b\overset{+}{\text{—}}\overbrace{a\text{—}g\text{—}f\text{—}e}\overbrace{\text{—}d\text{—}c\text{—}B}.$$

DIAZO-COMPOUNDS (from Gk. *δίς*, *dis*, twice + *azo-te*, old name of nitrogen, from Gk. *a*, *a* priv. + *ζώειν*, *zōein*, to live). An important group of carbon compounds discovered by Griess in 1860. They are produced by the action of nitrous acid on salts of amido-compounds, such as aniline hydrochloride. Thus, diazo-benzene chloride is produced according to the following equation:

$$\underset{\text{Aniline hydrochloride}}{C_6H_5NH_2.HCl} + \underset{\text{Nitrous acid}}{HNO_2} = \underset{\text{Diazo-benzene chloride}}{C_6H_5N = N.Cl} + 2H_2O.$$

The fatty amines (see AMINES) cannot thus be converted into diazo-compounds.

The diazo-compounds are usually obtained in solution and are immediately transformed into other compounds. They may, however, be readily isolated. When pure and dry, they are colorless crystalline solids, chemically unstable and more or less highly explosive. Many important carbon compounds, including a number of very valuable dyestuffs (see COAL-TAR COLORS), can be prepared from the diazo-compounds. The following are the most important transformations of these peculiar substances:

(1) When an aqueous solution of a diazo-compound is warmed, the compound is transformed into the corresponding phenol. (See PHENOLS.) Thus, diazo-benzene nitrate (obtained by the action of nitrous acid on aniline nitrate) gives ordinary phenol (carbolic acid), according to the following equation:

$$\underset{\text{Diazo-benzene nitrate}}{C_6H_5N = N.NO_3} + \underset{\text{Water}}{H_2O} = \underset{\text{Carbolic acid}}{C_6H_5OH} + \underset{\text{Nitrogen}}{N_2} + \underset{\text{Nitric acid}}{HNO_3}$$

(2) When heated with alcohol, a diazo-compound is transformed into the corresponding hydrocarbon. Thus, diazo-benzene chloride yields benzene, as follows:

$$\underset{\text{Diazo-benzene chloride}}{C_6H_5N = N.Cl} + \underset{\text{Alcohol}}{C_2H_5OH} = \underset{\text{Benzene}}{C_6H_6} + \underset{\text{Aldehyde}}{CH_3CHO} + N_2 + HCl$$

(3) With cuprous salts diazo-compounds form additive products, which, on heating, break up according to the following equations:

$$\underset{\text{Diazo-benzene chloride, cuprous chloride}}{C_6H_5N = N.Cl.Cu_2Cl_2} = \underset{\text{Chloro-benzene}}{C_6H_5Cl} + \underset{\text{Cuprous chloride}}{Cu_2Cl_2} + N_2$$

$$\underset{\text{Diazo-benzene iodide, cuprous iodide}}{C_6H_5N = N.I.Cu_2I_2} = \underset{\text{Iodo-benzene}}{C_6H_5I} + \underset{\text{Cuprous iodide}}{Cu_2I_2} + N_2$$

$$\underset{\text{Diazo-benzene cyanide, cuprous cyanide}}{C_6H_5N = N.(CN).Cu_2(CN)_2} = \underset{\text{Phenyl cyanide}}{C_6H_5CN} + \underset{\text{Cuprous cyanide}}{Cu_2(CN)_2} + N_2$$

(4) When diazo-compounds are subjected to the reducing action of stannous chloride and hydrochloric acid, they are transformed into derivatives of hydrazine (q.v.), the well-known phenyl-hydrazine, for instance, being thus readily obtained from diazo-benzene compounds.

The four transformations just noted may evidently be employed in the preparation of the important series of aromatic compounds known respectively as hydrocarbons, phenols, halogen derivatives of the hydrocarbons, and hydrazines. Moreover, since the cyanides (nitrils) of hydrocarbon radicals are readily transformed into the corresponding acids (e.g. C_6H_5CN into benzoic acid, C_6H_5COOH), the aromatic acids, too, may be added to the list of substances that may be prepared from diazo-compounds. And, remembering that the diazo-compounds themselves are readily obtained from the amido-compounds, which are in turn readily obtained by the transformation of the hydrocarbons abundantly found in coal-tar, it is easy to see that, by means of the diazo-reaction, there is no difficulty whatever in obtaining a very large number of organic compounds. See also AZO-BENZENE.

DIAZO-BENZENE. The mother-substance of the diazo-compounds is diazo-benzene, a very unstable substance, which has never been isolated in the pure state, and which probably corresponds to the formula $C_6H_5N = N.OH$.

DIBBS. An English name of a game of great antiquity, played by boys and girls. In Russia it is played sometimes even by old men. It consists in throwing up the small joint-bones of the legs of sheep, and catching them first on the palm and then on the back of the hand. The antiquity of this simple kind of play is proved by figures on Grecian vases, on which women are seen kneeling and engaged in the sport. In Scotland, where the game is more usually played with small pebbles or shells, it is called 'the chucks.' Out of 'dibbs' developed the game of jack-stones.

DIB'DIN, CHARLES (1745-1814). An English dramatist and song-writer. He was born at Southampton, and began his literary career with an opera called *The Shepherd's Artifice*, produced at Covent Garden Theatre in 1762. Already a popular actor, he gained great celebrity, in 1789, by a series of musical entertainments, entitled *The Whim of the Moment*. He died in straitened circumstances. Dibdin wrote about seventy dramatic pieces, and, according to his own account, 900 songs, of which the best known are "Poor Jack" and "Tom Bowling." He composed the music of his songs and sang them himself. Of his sea-songs, he said: (they) "have been the solace of sailors in long voyages, in storms, in battle; and they have been quoted in mutinies to the restoration of order and discipline." His sons, Charles and Thomas John, wrote songs and dramas. Consult Dibdin, *The Dibdins* (London, 1888).

DIBDIN, THOMAS FROGNALL (1776-1847). A British bibliographer. He was born at Calcutta, India; studied at Oxford, and, after a short career as a lawyer, entered the Established Church in 1804. He began his work in 1797, and, until 1844, produced a great number of publications of a bibliographical and antiquarian character, which, while they show an immense amount of labor, are so full of inaccuracies as to be almost totally unreliable. His *Bibliomania*

(1809) was effective in stimulating interest in rare and early editions, and led to the hearty reception of his proposal for an association of bibliophiles, which was organized as the Roxburghe Club (q.v.) in 1812. In addition to the *Bibliomania*, Dibdin's principal works are: An *Introduction to the Greek and Latin Classics* (1802); *Typographical Antiquities of Great Britain* (4 vols. 1810-19); *The Bibliographical Decameron* (1817); *Bibliotheca Spenceriana* (1814); *Bibliographical, Antiquarian, and Picturesque Tour in France and Germany* (1821); *The Library Companion* (1824); *and Reminiscences of a Literary Life* (1836).

DI'BON. The name of two cities mentioned in the Bible. (1) A city in Moab, the modern Dhiban, about four miles north of Arnon (Wady Mojib) on the road between Heshbon and Petra. According to Num. xxxii. 34, it was built by the Gadites, and, in harmony with this account, the place is referred to as Dibon-Gad in Num. xxxiii. 45. In Num. xxi. 30, the Amorite king, Sihon, is said to have reigned over Moab 'from Heshbon to Dibon'; but the ancient song whence this fragment is taken probably celebrated victories of Israel over Moab, Sihon being a later insertion. If that is correct, the passage indicates the importance of Dibon in the ninth century B.C. That is also emphasized by the Mesha inscription found by Klein at Dibon in 1868. (See MOABITE STONE.) Mesha is here called the Dibonite, or Diabonite, as the presence of the *yod* and the Greek *Δαίβων* suggests that the true pronunciation was. It is not quite clear whether the name is limited to the city, or extended to the adjacent territory, and it has therefore been supposed that the proper name of the city in earlier times was Qorcha, and Daibon the name of the district. But it is more probable that Qorcha was the name of a certain quarter of the city where the royal residence was, and that the relation between Qorcha and Daibon was analogous to that between Zion and Jerusalem. (2) A place in Judah, mentioned in Neh. xi. 25, the present Dhaib, five miles north of Arad.

DIBRAN'CHIA'TA (Neo-Lat. nom. pl., from Gk. *δίς*, *dis*, twice + *βράγχια*, *branchia*, gills). A group of cephalopod mollusks, characterized by the presence of a pair of gills, and by the internal position of the shell, as contrasted with the two pairs of gills and external shell of the tetrabranchiate nautiloids; the dibranchiate skeleton supporting the internal organs; the tetrabranchiate shell serving as an external protective covering to the animal. The Dibranchiata have undoubtedly been evolved from the Tetrabranchiata, probably in Triassic time, and there are even yet a few living forms, as Spirula, which are relics of the early intermediate stages between the two groups. Modern examples are the cuttlefish, squid, octopus, and sepia (qq.v.); while Belemnites (q.v.), Belemnoteuthis, Geoteuthis (q.v.) are a few of the many fossil forms which range from Triassic to recent times. For illustration, see Colored Plate of DECAPODS, ETC.

DI'CÆAR'CHUS (Lat., from Gk. *Δικαίαρχος*, *Dikaiarchos*). A Greek philosopher of Messina, in Sicily, and a contemporary of Aristotle. The extant fragments justify the ancients, including Cicero, in their praise of his works. Of these it is quite impossible to determine an accurate bibliography, since many referred to as independent works were probably sections of larger volumes. His *Βίος Ἑλλάδος* ("The Life of Greece"), in addition to political affairs, took some account of poetry, music, and the games, and was thus the pioneer attempt in what the Germans style *Kulturgeschichte*.

DICÆ'UM (Neo-Lat., coined by Cuvier, 1817). A genus of Oriental and Australasian small birds, typical of a family, Dicæidæ, closely allied to the sun-birds. They are sometimes called honey-peckers or flower-peckers (in India), but without much reason, and the scientific name has become English in Australia, where the family is most prominent. All are small, brilliant-colored, insect-eating birds, with melodious voices, and most of them build elegant purse-shaped nests of soft materials suspended from bushes. The swallow-dicæum (*Dicæum hirundinaceum*) is one of the best-known, and resembles in size, shape, and habits one of the northern kinglets, but is purple-blue, with a red throat and under tail-coverts. Some ornithologists put here also the diamond-bird (q.v.), but most class it elsewhere. See Plate of PENSILE NESTS OF BIRDS, with NIDIFICATION.

DI'CAST (Gk. *δικαστής*, *dikastēs*, from *δίκη*, *dikē*, right, justice). A member of the popular courts of Athens. These courts seem to have been instituted by Solon, and from the fifth century B.C. were a most important part of the democratic government. From the body of Athenian citizens over thirty years of age, there were chosen annually by lot 6000 in the fifth century, 5000 or possibly fewer in the fourth century. From this number ten sections, of not over 501, were chosen daily to hear cases. In very important trials two or more sections might be combined, and we hear of one court of 2500 jurors. The evidence was taken beforehand by a magistrate, who presided at the trial, and the dicasts merely listened to the speeches of the parties to the suit, and the reading of the evidence. The voting was secret, and the dicasts were sworn to render their decision in accordance with the laws and evidence. Unlike a modern jury, they were the sole judges of the law, as well as of the facts; a condition which hindered the development in Athens of any such body of judicial precedents as grew up in Rome.

DICE (OF. *de*, *det*, Fr. *dé*, Sp., Port., It. *dado*, die, from Lat. *datus*, p.p. of *dare*, to give). The origin of dice is variously ascribed by some authors to occult sources, but more authentically to Psalmedes of Greece, B.C. 1244. Without question, the games played with them are the simplest and most universal games of chance in the world. The dice exhumed from Thebes differ in no respect from the six-sided cubes of bone or ivory in use to-day, with spots ranging on each side from 6 to 1, the sum of the spots on the opposite sides of a cube always making 7. Dice are thrown nearly universally from a cylindrical hollow case, but among the negroes, in the game of craps (q.v.), they are cast from the hand. Mostly they are thrown from the box upon a table, but it was not uncommon in some parts of England until quite recent times to throw them into a bowl, and in Hieronymus, a game much affected in the army, the dice are placed upon a strip round the top of a bowl, and the bowl twirled round, the force of the twirl dislodging the dice into the bottom of the bowl, where they are counted. According to the purposes of the cast, any number, from one to five dice, are cast. The highest aggregate numbers exposed on the top of the dice when they settle, in one or more throws, as agreed, win. There are a variety of other purely dice games, such as 'round the spot,' wherein only those spots which lie round a centre spot are counted, such as three or five—the first counting two, and the other four; 'multiplication,' in which the first throw is three dice, the highest being left on the table and the two thrown again, the highest being again left, and the last one thrown again; and 'draw poker,' played with five dice, each player having one throw, and the privilege of a second. In the first throw all the dice are thrown, but the player need not take them all up; he may select only those which are satisfactory to him, or leave the whole. The throws rank as in the card game of poker (q.v.), beginning with the lowest: one pair, two pairs, triplets, a full hand, four of the same; the highest throw is five alike. '*Vingt-un*' is played with a single die, each player throwing as often as necessary to get the sum of the spots equal to, or as near as possible, not over, 21. 'Ace in the pot' and 'help your neighbor' are other combinations of throwing the dice, or, in other words, 'casting the die.' Unscrupulous gamblers adopt the practice of loading dice, by plugging them with lead on a particular side, so that the highest number may turn up, by gravitation, as the dice roll out of the box.

DICENTRA (Neo-Lat. nom. pl., from Gk. *δικεντρος*, *dikentros*, two-pointed, from *δι-*, *di-*, double + *κέντρον*, *kentron*, point). A genus of hardy perennial plants of the natural order Fumariaceæ. *Dicentra spectabilis*, bleeding-heart, a native of Siberia and the northern provinces of China, was introduced into Great Britain from the island of Chusan in 1846, and rapidly became a general favorite, on account of its long racemes of drooping, delicate, rosy-pink flowers. The common squirrel-corn (*Dicentra canadensis*) is one of the first spring flowers of the northern and eastern United States, as is also Dutchman's-breeches (*Dicentra cucullaria*). Dielytra is an old name for the genus Dicentra.

DICEY, dī′sī, Albert Venn (1835—). An English barrister and author. He was educated at Balliol College, Oxford, was admitted to the bar in 1863, was in 1882 appointed professor of English law in the university, and later became a fellow of All Souls. He received in 1890 an appointment to the Queen's Council, and in 1899 became principal of the Workingmen's College. His publications include: *The Privy Council* (Arnold prize essay, 1860 and 1887); *The Law of Domicil* (1879); *England's Case Against Home Rule* (1886); a *Treatise on the Conflict of Laws* (1896); *Lectures on the Relation Between Law and Public Opinion in England During the 19th Century* (1905).

DICEY, Edward (1832—). An English journalist and author. He was educated at Trinity College, Cambridge, was for a time a leader-writer for the *Daily Telegraph*, and from 1870 to 1889 was editor of the *Observer*. In 1875 he was called to the bar. He is regarded as an authority on matters appertaining to South Africa, Bulgaria, and Egypt, and has advocated the annexation to Great Britain of that country. His publications include: *Rome in 1860* (1861); *The Schleswig-Holstein War* (1864); *The Morning Land* (1870); *England and Egypt* (1884); *Bulgaria, the Present State* (1895); and *Story of the Khedivate* (1902).

DICHOGAMY, dī-kŏg′ȧ-mī (Gk. *δίχα*, *dicha*, in two + *γάμος*, *gamos*, marriage). Flowers whose anthers and stigmas do not mature at the same time are said to be dichogamous. 'Protandry' is the condition in which the anthers mature first; 'protogyny' that in which the stigmas mature first. See Pollination.

DICHOTOMY, dī-kŏt′o-mī (Gk. *διχοτομία*, *dichotomia*, a cutting in two, from *δίχα*, *dicha*, in two + *τέμνειν*, *temnein*, to cut). In botany, a form of branching in which the axis forks at the apex and hence continues no farther. It is specially characteristic of cryptogams. (See Branching.) In logic, the method of exhaustive division in classification, of which the device known as the Tree of Porphyry may be considered typical (see e.g. *Lessons in Logic*, W. Stanley Jevons, London, 1880). In metaphysical anthropology, the theory of man as a twofold being, physical and spiritual, or consisting of body and soul.

DI′CHROISM (from Gk. *δι-* *di-*, double + *χρόα*, *chroa*, color), **TRI′CHROISM, PLE′OCHRO′ISM.** Crystals not only absorb in different amounts the light of different wavelengths; but, unlike uncrystalline or amorphous substances, the amount and kind of absorption differs according to the direction in which light is transmitted through the crystal. This selective and differential light-absorption is rarely perceived by the unaided eye, because so many rays from a crystal enter the eye simultaneously. If, however, polarized light be employed to bring successively into the eye light-rays which at any given instant vibrate along a single direction of a colored crystal, a change in color is generally noticeable. This selective light-absorption along the different directions within a crystal is termed dichroism or pleochroism. Crystals of the isometric system alone possess no pleochroism. Crystals of the tetragonal and hexagonal systems exhibit two extreme colors (dichroism), between which all the other colors produced clearly graduate. Crystals of the remaining crystal systems exhibit three extreme colors (trichroism), with regard to which all the other colors produced by the crystal are intermediate. The dichroscope is a simple device for measuring both the quality and quantity of dichroism. See Crystallography.

DI′CHROITE. See Iolite.

DICHRO′MATISM IN BIRDS (Gk *δι-*, *di-*, double + *χρῶμα*, *chrōma*, color). The name given to that peculiar occurrence of two phases of color in the plumage of a species of bird, not due to age, sex, or health, which is so well illustrated by the common screech-owl of the United States (*Megascops asio*), some individuals of which are gray and some rusty red. This phenomenon is not infrequent among birds, but it is not always easy to determine what constitutes a clear case of it. Thus some ornithologists regard the various species of flicker (Colaptes) as di- or rather tri-chromatic forms of a single species, while others do not regard this as the same sort of a phenomenon as the color phases of the screech-owl. There are at least three distinct forms of dichromatism, known as *albinism*, *melanism*, and *erythrism*. The first is that form in which one of the phases is white, and a number of examples occur among the herons, as well as in other groups of birds. One of the best-known cases is that of the little blue heron (*Ardea cærulea*), some specimens of which are pure white, while others are slaty-blue. It was at one time supposed that the former were the young, the latter the adults; but careful study on their breeding grounds has shown that the differences are not associated in any way with age or sex. Some evidence has been produced to show that geographical conditions may have something to do with the matter, for the white birds are said to be most common on the Atlantic coast of Florida, while the colored phase is most abundant on the Gulf coast. Melanism is a form of dichromatism in which one color phase becomes very dark, almost or quite black. Examples of this occur among the large hawks of the genus Buteo. It should be stated that in these cases the color phases are not sharply set off from each other, as in the herons, and the melanism is closely associated with distribution. Erythrism is the form shown by the screech-owls, already referred to, in which one phase tends to become red.

A satisfactory explanation of dichromatism is still to be offered, but recent investigations have thrown some light upon it. In the screech-owl, the red phase is due to a 'quantitative difference' in the distribution and relative amounts of pigment, and gray individuals may and do become red. In other cases, such as the herons, it is more than possible that we have examples of species in the process of formation, and that at some future day the slaty-blue individuals of the little blue heron, for example, will breed only with slaty-blue individuals and produce only slaty-blue offspring, while the white birds will breed only with white birds and produce white young. We should then have just such a condition as now exists in the ibises of the genus Gaura. The white ibis (*Gaura alba*) and the scarlet ibis (*Gaura rubra*) are exactly alike, except for the striking difference in color, but they never breed together and are therefore regarded as two distinct species, and not as dichromatic forms of one. The whole question is one of exceptional interest, and seems to be closely bound up with that of the origin of species.

DICHTUNG UND WAHRHEIT, dĭK'tụng ụnt vär'hīt. See Goethe.

DICK, John (1764-1833). A Scotch Secession theologian. He became pastor in Glasgow in 1801 and theological professor in 1820, and is remembered for his *Lectures on Theology* (4 vols., with memoir, 1834).

DICK, Mr. A household abbreviation for Mr. Richard Dabley, a demented character in Dickens's *David Copperfield*, who flies kites, jingles sovereigns, and has great difficulty in keeping the head of King Charles I. out of the 'Memorial.'

DICK, Sir Robert Henry (c.1785-1846). A Scotch soldier. He served as an officer in the Peninsular War, fighting at Busaco, Feuntes de Onoro, and Salamanca. He distinguished himself at Quatre Bras and Waterloo; in 1837 was promoted to be major-general, and in 1841-42 was commander-in-chief at Madras. In 1846 he assumed command of the Third Infantry Division in the Sikh War. He fell while leading a charge against the Sikh intrenchments at the victory of Sobraon.

DICK, Thomas (1774-1857). A Scottish scientific writer. He was born near Dundee, and studied science and theology at the University of Edinburgh. After a brief pastoral charge in connection with the Secession Church of Scotland, he devoted himself to teaching, lecturing, occasional preaching, and authorship. Toward the close of his life a small pension was granted him in consideration of his literary services, his books having brought him very little pecuniary return, in spite of their great popularity both in England and the United States. He died at Broughty Ferry, near Dundee. Dick's principal works are: *The Christian Philosopher, or the Connection of Science and Philosophy with Religion* (1823; 8th ed. 1842); *The Philosophy of Religion* (1825); *The Philosophy of a Future State* (1828); *Celestial Scenery* (1837); *The Sidereal Heavens* (1840); and *The Practical Astronomer* (1845). Several of Dick's writings have been translated into foreign languages; one even into Chinese.

DICK BEQUEST. A fund now amounting to some £122,000, established in 1828 by James Dick, of Finsbury Square, London, for the benefit of the parish schoolmasters of Moray, Banff, and Aberdeen, Scotland. These funds yield about £4000 a year, which is distributed as an honorarium among the schoolmasters on the basis of their acquirements in the English language and literature, geography, mathematics, Latin, Greek, history, physics, and the art of teaching. Mr. Dick's object was to encourage active schoolmasters, and gradually to elevate the literary character of the parochial schoolmasters and schools. His purpose has been so far successful that the grade of these schools has been advanced, and in many cases students go directly from them to the universities.

DICK-CISSEL (imitative). The black-throated bunting (*Euspiza Americana*) of the open regions of the central United States, one of the most pleasing of American fringilline birds. Its back is black, chestnut, and grayish; bend of the wing, bright chestnut; chin, white; throat, black, in a conspicuous crescent; breast, yellow, changing to white toward the tail. The female lacks the black breast-mark and the chestnut colors. The species is migratory, coming northward to make its nest on the ground, or in a low bush, where pale-blue eggs are laid. It is a loud and persistent singer. "All day long," says Ridgway, "in spring and summer, the males, sometimes to the number of a dozen or more for each meadow of considerable extent, perch upon summits of tall weed-stalks or fence-stakes, at short intervals, crying out: '*See, see*—dick—dickcissel, cissel;' therefore 'Dick Cissel' is well known to every farmer's boy." See illustrations on Plates of Buntings, etc., and on Eggs, I.

DICK'ENS, Charles (1812-70). An English novelist. He was born at Landport, then a suburb of Portsmouth. His father, John Dickens, who held a post in the navy pay office, was then stationed at Portsmouth, but about 1816 they moved to Chatham, and afterwards to London. The family was poor and improvident. The schooling of Charles was slight, but he read considerably at home and in the British Museum, and learned shorthand. He was educated by contact with life itself. After a period of reporting in the courts and in the House of Commons, Dickens began in the *Monthly Magazine* (December, 1833), and continued in the *Evening Chronicle*, a series of essays and tales, collected and published in 1836, under the title *Sketches by Boz*. Encouraged by their success, he undertook to write the letterpress of the *Posthumous Papers of the Pickwick Club*, the illustrations of which were to be executed by Robert Seymour, a comic draughtsman. As soon as Dickens introduced Sam Weller, the plates became of secondary interest. The *Pickwick Papers*, which appeared in monthly numbers (1836-37), not only had enormous commercial success, but they also mark an era in English literature. It was the first of a series of fictions exhibiting the life and manners of the middle and lower classes, which up to that time had rarely found an exponent, and in one respect this book had neither predecessor nor progeny. Neither before nor since has there ever been such a literary embodiment of healthy animal spirits. There is none like it for unflagging but never unwise merriment—for humor that is very much the reverse of dry. *Pickwick* was followed by *Oliver Twist* (1837-39) and *Nicholas Nickleby* (1838-39), adventures in the picaresque manner. They are among the first of those social novels which form so marked a feature of modern literature. The former was a ludicrous exposure of workhouses; the latter was aimed at the wrongs and cruelties inflicted upon their wretched pupils by the cheap schoolmasters of Yorkshire. Both hit their mark. After this beginning, Dickens set lance in rest against many a social monster. He may be sometimes wrong, but in spite of his exaggerations he can scarcely be accused of want of honesty of purpose; while quite as little can partisanship (except that he is always for the poor) be laid to his charge, since at the very time when the country gentlemen were shaking their heads at him for his want of reverence for 'land,' he incensed the manufacturing interest by the publication of *Hard Times* (1854). His sarcasm is of a rather peculiar character; too good-natured to sneer, and with eyes, notwithstanding their indignant fire, that never lose sight of the ludicrous side of things; his style is mocking argument. After *Nicholas Nickleby* came *The Old Curiosity Shop* (1840) and *Barnaby Rudge* (1841). In the former, in the character of Little Nell, he first exhibited a power of setting forth child life and child thought, unequaled before the appearance of George Eliot. *Barnaby Rudge* was his first, and, with the exception of the *Tale of Two Cities* (1859), his only attempt to describe the past; and it was successful. A disposition of mind toward the weird and the grotesque, which showed itself in *The Old Curiosity Shop*, was subsequently developed with greater success in his *Christmas Stories* (1853), especially in *A Christmas Carol*. After a voyage across the Atlantic, Dickens published, in 1842, *American Notes for General Circulation;* but a much more admirable result of that visit to the United States appeared in *Martin Chuzzlewit* (1844), which was certainly the greatest of his humorous works since *Pickwick*. After this masterpiece, his animal spirits—a rare gift among even comic authors, and seldom lasting so long as in his own case—began to desert him. Humor, except in some rich creations, such as Mr. Micawber, was no longer so apparent; while, on the other hand, satire and pathos increased. *Dombey and Son* (1848) was considered a falling off in one who stood so high. Yet, when men were expecting that he would wane and weaken like other prolific writers before him, he produced *David Copperfield* (1850), a favorite with many, and preferred by Dickens himself to all his other novels. In this novel he adopted the form of an autobiography, and that perhaps offered him some advantages; at all events, the result was admirable. *Bleak House* (1853); *Hard Times* (1854); *Little Dorrit* (1857); *A Tale of Two Cities* (1859); *Great Expectations* (1861), regarded by Swinburne as the best and most artistic of Dickens's books; and *Our Mutual Friend* (1865), afterwards succeeded one another with almost periodical punctuality, and each was awaited by an immense audience. In 1846 the *Daily News* was started, under Dickens's editorship, but the task appears to have been uncongenial, for he soon withdrew from it. In 1850 he commenced a weekly periodical entitled *Household Words*, afterwards merged in *All the Year Round*. In 1867 he again visited America, giving numerous readings and meeting with a brilliant reception. He was at the last engaged in writing a new novel, *The Mystery of Edwin Drood*, which was left unfinished. He died at Gadshill and was buried in Westminster Abbey.

The work of Dickens has been variously estimated. All admit his great humor; but to some his pathos seems much overdrawn. He possessed immense creative power, the number of his characters running into the thousands. The essence of his art is caricature, and for comic effect he exaggerated the abuses he attacked. In character building he hit upon some oddity and transformed it into a delightful type never to be forgotten. Consult: Forster, *Life of Dickens* (London, 1872-74); *Letters*, edited by Miss Hogarth and Miss Dickens (London, 1880-82); Gissing, *Charles Dickens: A Critical Study* (New York, 1898); Fitzgerald, *The History of Pickwick* (London, 1891); Kitton, *The Novels of Charles Dickens* (London, 1897); Chesterton, *Life of Charles Dickens* (New York, 1906); Thomson, *Bibliography* (Warwick, 1904). Essays and editions are numerous. One of the most recent editions is Kitton, *The Autograph Edition of Complete Works* (56 vols., New York, 1902).

DICK'IE, GEORGE WILLIAM (1844—). An American naval engineer. He was born at Arbroath, Scotland; studied mechanical and naval engineering, came to the United States in 1869, and was connected with steamship designing on the Pacific Coast. In 1883 he became manager of the Union Iron Works, San Francisco, Cal., and in that capacity became identified with the execution of much naval work for the United States Government. He was at one time president of the Technical Society of the Pacific Coast. Consult his *Pumping and Hoisting Works* (1876).

DICK'INS, JOHN (1747-98). An American clergyman. He was born in London and was educated at Eton, but came to America before the Revolution, and was one of the most efficient promoters of the Methodist Episcopal Church in this country. He preached in Virginia and North Carolina, and in 1783 took charge of the John Street Church in New York City. In 1789 he was stationed in Philadelphia, and there established the 'Methodist Book Concern,' afterwards removed to New York. Consult Atkinson, *Centennial History of American Methodism* (New York, 1884).

DICK'INSON, A city and county-seat of Stark County, N. Dak., 310 miles west of Fargo, on the Northern Pacific Railroad (Map: North Dakota, C 3). A State agricultural experiment station is located there. Its chief industries are stock raising, wheat growing and pressed brick works. First settled in 1880, its government in 1906 was vested in a mayor, elected biennially, and a unicameral council. It owns and operates its own water-works. Pop., 1905, 3188.

DICKINSON, Anna Elizabeth (1842—). An American lecturer, author, and actress, born in Philadelphia. When but fourteen years of age she wrote for the *Liberator* an article on "Slavery." In 1859 she made her first speech at a meeting of Progressive Friends in Philadelphia, and thereafter became prominent for her fiery addresses on total abstinence, abolition, politics, and woman suffrage. After a time she devoted her whole attention to lecturing and to the drama, writing *A Crown of Thorns* (1876), *True to Herself*, and *What Answer?* (1868), a novel; *Mary Tudor* and *Aurelian*, dramas; and *A Ragged Register of People, Places, and Opinions* (1879).

DICKINSON, Daniel Stevens (1800-66). An American statesman, born in Goshen, Conn. He was admitted to the bar in 1828, was elected to the Senate of New York State in 1836, became Lieutenant-Governor in 1842, and in 1844 was appointed by the Governor to a vacancy in the United States Senate. In 1861 he was elected Attorney-General of New York, and in 1865 was appointed District Attorney for the Southern District of the State. During the Civil War he actively supported the cause of the Government. Mr. Dickinson became widely known as an able debater, and for a time was leader of the Democratic party in New York. Consult Dickinson's *Life and Works* (2 vols., New York, 1867).

DICKINSON, Donald McDonald (1846—). An American lawyer. He was born at Port Ontario, N. Y., graduated at the University of Michigan in 1866, and was admitted to the bar in 1867. He was Postmaster-General in 1888-89, chairman of the National Democratic Campaign Committee in 1892, and senior counsel for the United States before the Bering Sea Claims Commission in 1896.

DICKINSON, Emily (1830-86). An American poet, born at Amherst, Mass. She lived a secluded life, and published almost nothing during her lifetime. At her death T. W. Higginson, with Mrs. Mabel Loomis Todd, edited a volume entitled *Poems by Emily Dickinson* (1890), which attracted considerable attention and was followed by another volume of poems, as well as by a volume of selected letters. In thought her introspective lyrics are striking if not impressive, and are deficient in form.

DICKINSON, John (1732-1808). An American statesman and publicist, known as the "Penman of the Revolution." He was born in Talbot County, Md., but in 1740 removed with his father to Delaware. He began the study of the law in Philadelphia in 1750; entered the Middle Temple, London, England, in 1753, and in 1757 began practice in Philadelphia. In 1760 he became a member of the Delaware Assembly, and in 1762 was elected to the Pennsylvania Assembly, where he served with great distinction until 1765, and again from 1770 to 1776. He was also a member of the Stamp Act Congress, and from 1774 to 1776 of the Continental Congress; served for a time in the American Army, first as a private and afterwards as a brigadier-general in the Delaware militia; was Governor of Delaware from 1781 to 1782, and of Pennsylvania from 1782 to 1785; and afterwards took a prominent part in the debates of the Constitutional Convention of 1787, and in the discussions in Pennsylvania and Delaware over the ratification of the Constitution. He is best known, however, as a writer of State papers and pamphlets, in which capacity up to 1776 he ranked foremost among his contemporaries. Among the important State papers which he drafted or wrote were the "Resolutions in relation to the Stamp Act," adopted by the Pennsylvania Assembly in 1765; the "Declaration of Rights" and the "Petition to the King," adopted by the Stamp Act Congress; the "Essay on the Constitutional Power of Great Britain over the Colonies in America," adopted by the Pennsylvania Convention; the "Address of Congress to the Inhabitants of the Province of Quebec"; the "Petition of Congress to the King"; the "Declaration by the United Colonies of North America . . . Setting Forth the Causes and Necessity of Their Taking up Arms"; the "Articles of Confederation" (first draft); and the "Address of Congress to the Several States on the Present Situation of Affairs" (1779). In addition, he wrote numerous pamphlets and newspaper articles, the most famous of which were the celebrated *Farmer's Letters*, published at Philadelphia in 1767. These 'letters' had a wide circulation and produced such an effect on both sides of the Atlantic that their appearance has been regarded as 'the most brilliant event in the literary history of the Revolution.' Dickinson's influence waned after 1776 on account of his opposition to the Declaration of Independence, which he refused to sign, but a series of papers written by him in 1787-88, under the pseudonym 'Fabius,' were widely read and contributed much toward inducing Pennsylvania and Delaware to ratify the Constitution. In the literature of the Revolution, says Ford, the editor of Dickinson's writings, he was "as preëminent as Washington in the war, Franklin in diplomacy, and Morris in finance." His *Writings*, edited by Paul L. Ford, were published, in part, at Philadelphia in 1895. Consult: Stillé, *The Life and Times of John Dickinson* (Philadelphia, 1891), and an excellent estimate of Dickinson's literary work in Tyler, *Literary History of the American Revolution* (New York, 1897).

DICKINSON, Jonathan (1688-1747). An American clergyman. He was born in Hatfield, Mass., and graduated at Yale in 1706. He was for thirty years a Presbyterian minister in Elizabethtown, N. J., and was long the leading Presbyterian minister in the country. In 1746 he was elected president of the College of New Jersey (now Princeton University). He wrote a number of theological works.

DICKINSON COLLEGE. An institution of higher education, situated at Carlisle, Pa. It was founded in 1783 and derived its name from John Dickinson, president of the Supreme Executive Council of Pennsylvania, and one of the college's largest benefactors. For twenty-five years the institution prospered; but in 1815 the interference of the trustees in the matters of discipline became so persistent that both president and instructors resigned. Repeated attempts to reopen the college met with small success, and it was not until 1833, under an amended charter closely delimiting the jurisdiction of the trustees, that the college became firmly reëstablished. Before that time it had been, though undenominational, under Presbyterian influence; under the new arrangement it passed to the control of the Methodist Episcopal Church. Dickinson comprises the college proper, the law school, and a closely affiliated preparatory school. The law school, organized in 1834, but discontinued from 1882 to 1890, offers the degree LL.B. The college confers the bachelor degree in arts, science, and philosophy. The buildings include: South College, East College, the Tome Scientific Building, the James W. Bosler Memorial Hall, and the Denny Memorial Hall. The library contains about 40,000 volumes. In 1906 the student enrollment, including that of the preparatory school, approximated 500. The endowment funds amount to $400,000, and the value of the college buildings and grounds to $440,000.

DICK'S COFFEE-HOUSE. A London coffee-house, originally called "Richard's," after Richard Torner or Turner, who was its first proprietor (1680). The building still stands, on the south side of Fleet Street (No. 8), near the Temple.

DICK'SON. A borough in Lackawanna County, Pa., 4 miles north of Scranton, on the Delaware and Hudson Railroad Company (Map: Pennsylvania, F 2). It is in a coal-mining region and has foundries and machine shops, and silk-mills. It is governed by a mayor and a unicameral council. Population, 1900, 4948.

DICK'SON, Sir James Robert (1832-1901). An Australian statesman. He was born at Plymouth, England, and was educated in Glasgow, Scotland, where he began his business career in a bank. He emigrated to Australia in 1854 and settled first in Victoria, whence he removed to New South Wales, and afterwards, in 1862, to Queensland. His political career began in 1872, when he was elected to the Queensland House of Assembly. In 1876 he entered the Cabinet of Arthur Macalester, as Minister of Public Works. He held the position of Treasurer of the colony in various cabinets from 1876 to 1879, and 1883 to 1887. From 1889 to 1892 he lived in Europe, returning in the latter year to conduct a campaign in favor of introducing Polynesian labor in the Queensland sugar plantations. In 1897 he entered the Nelson Cabinet as Secretary for Railways. In March, 1898, he became Secretary for Home Affairs, and in October following he succeeded Thomas J. Byrnes as Premier. In this position, he threw himself into the fight for an Australian Commonwealth, secured the passage of a measure providing for the submission of the question to the people, and after an active campaign obtained a good majority at the polls in favor of federation. He resigned the Premiership in November, 1899, and early in 1900 visited London as a delegate from Queensland to discuss the affairs of the proposed Commonwealth. On his return to Australia he was selected Minister of Defense of the first Federal Cabinet, but died suddenly ten days after the inauguration of the new Government.

DICKSON, dĕk'sôn, Baron Oscar von (1823-97). A Swedish merchant. He was born at Göteborg, of Scottish ancestry. He was a member of many learned societies both in London and abroad, and gave liberal pecuniary support to North Pole enterprises, particularly those undertaken by Baron Nordenskjöld after 1868. In recognition of his distinguished public services, he was ennobled in 1880, the title of "Baron" being conferred on him in 1885. Dickson Harbor and various other points in the Arctic regions have been named in his honor.

DICK'SON, Samuel Henry (1798-1872). An American physician. He was born in Charleston, S. C., graduated at Yale in 1814, and in 1819 received the degree of M.D. at the University of Pennsylvania. He was appointed to the professorship of the institutes and practice of medicine in the medical school of Charleston, S. C., in 1824, was professor of the practice of medicine in the University of New York from 1847 to 1850; in 1858 accepted the chair of the practice of medicine at Jefferson College in Philadelphia. He published many volumes and papers on medical subjects, including *Studies in Pathology and Therapeutics* (1867).

DICKSON, William Purdie, D.D. (1823-1901). A Church of Scotland theologian. He was born at Pettinain Manse, Lanarkshire, October 22, 1823; graduated at Saint Andrews; was, from 1863 to 1895, a divinity professor in Glasgow University, and then professor emeritus. Besides translating Mommsen's *History of Rome* (4 vols., rev. ed. 1895) and *Roman Provinces* (1887), and Meyer's *Commentary on the New Testament* (10 vols., 1873-80), he delivered the Baird lectures of 1883, *Saint Paul's Use of the Terms Flesh and Spirit* (1883).

DIC'LINOUS PLANT (Gk. *δι-*, *di-*, double + *κλίνειν*, *klinein*, to incline). A plant which has stamens and pistils in separate flowers. If the two kinds of flowers are on the same individual, the plant is called 'monœcious'; if on different individuals, 'diœcious.' See Pollination.

DI'COTYLE'DONS (Neo-Lat., from Gk. *δι-*, *di-*, double + *κοτυληδών*, *kotylēdōn*, cup-shaped, hollow, from *κοτύλη*, *kotylē*, cavity). The larger and more important of the two groups of flowering plants, angiosperms (q.v.). Its members represent the culmination of the plant kingdom, and are the most conspicuous and the most modern of plants. More than 80,000 species have been described, and the actual number is probably over 100,000. The chief characters which distinguish them from monocotyledons, the other group of angiosperms, are an embryo with lateral cotyledons (usually two); the vascular bundles of the stem forming a hollow cylinder, which means an annual increase in the diameter of woody stems; an open system of venation, which means that the veinlets end freely in the tissues of the leaf or in the margins, often resulting in various forms of toothing, lobing, and branching; and flowers whose tendency is to display their parts in fives or fours or their multiples.

Two great groups of dicotyledons are recognized—the Archichlamydeæ and the Sympetalæ. In the former there is either no perianth (calyx and corolla), or its parts are separate (polypetalous); in the latter the corolla is sympetalous (petals coalesced). Formerly the Archichlamydeæ were divided into two groups—the Apetalæ, in which there are no petals, and the Polypetalæ, in which petals are present; but this division has been found to be too artificial to stand, as several natural families have both apetalous and polypetalous members.

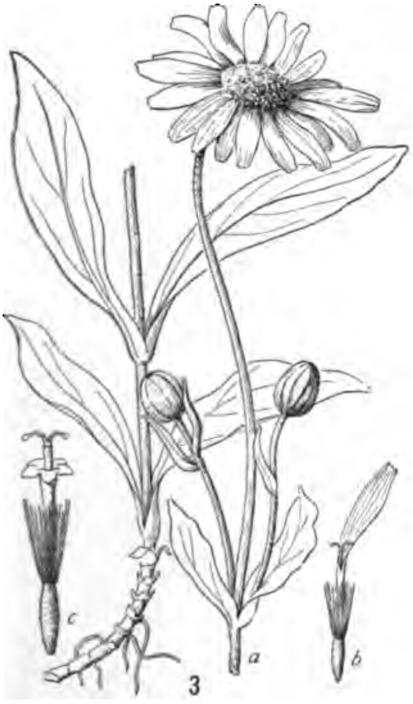
Archichlamydeæ. These are the simpler and more primitive dicotyledons, and contain about 40,000, or one-half of the known species of dicotyledons, distributed among about 160 families. The prominent alliances may be given as follows: (1) A great tree assemblage, prominent in which are the oak, hickory, walnut, chestnut, beech, poplar, elm, willow, etc. These plants are probably the most primitive of the dicotyledons, a fact indicated by the simplicity of their floral structures and by their anemophilous (wind-pollinating) habit. (See Pollination.) Prominent in the group also is the characteristic inflorescence known as the ament (q.v.) or catkin; and it is among its members alone that chalazogamy (q.v.) has been discovered. (2) The buttercups and their allies, a great assemblage of terrestrial herbs, including waterlilies, buttercups, poppies, and mustards; certain notable tree forms, as the magnolias, custardapples, sassafras, etc.; and also the strange group of 'carnivorous plants' (Sarracenia, Drosera, Dionæa, etc.). (3) The rose family (Rosaceæ), which is one of the best-known and most useful groups of the temperate regions, including such forms as the strawberry, raspberry, blackberry, rose, hawthorn, apple, pear, quince, plum, cherry, peach, etc. (4) The legume family (Leguminosæ), which is far the greatest family of the Archichlamydeæ, which contains about 10,000 species, and with flowers elaborately constructed for insect pollination. Here belong the lupine, clover, locust, pea, bean, vetch, redbud, senna, honey-locust, indigo, sensitive plants, etc. (5) The umbellifer family (Umbelliferæ), which is the most highly organized of the Archichlamydeæ, and contains such well-known forms as the carrot, parsnip, hemlock, pepper-and-salt, caraway, fennel, coriander, celery, parsley, etc.

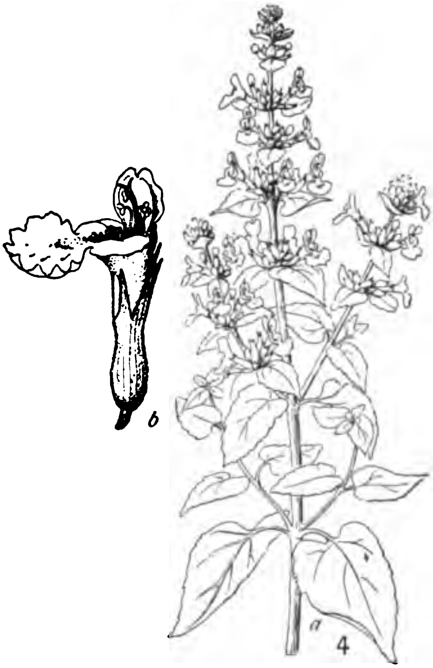
Sympetalæ. This group is evidently derived from the Archichlamydeæ, and contains the most highly organized of plants. Older names of the group are 'Monopetalæ' and 'Gamopetalæ.' The group contains about 40,000 species, distributed among 50 families. Among the prominent alliances are the following: (1) The heath family (Ericaceæ), which consists mostly of shrubby plants, and which contains such forms as huckleberry, blueberry, cranberry, bearberry, trailing arbutus, wintergreen, heather, azalea, rhododendron, Indian pipe, etc. (2) The Convolvulus forms and their allies, in which the flowers are prominently tubular, including the morning-glory, polemonium, phlox, gentian, dog-bane, etc. (3) The mint family (Labiatæ) and its allies, containing about 10,000 species, and characterized by the irregular two-lipped flowers. Here belong the mint, dittany, hyssop, marjoram, thyme, balm, sage, catnip, horehound, lavender, rosemary, etc. In allied families are the nightshade, potato, tomato, tobacco, mullein, snapdragon, toadflax, painted-cup, verbena, plantain, etc. (4) The Compositæ, the greatest and ranking family of the angiosperms, is estimated to contain at least 12,000 species. The name of the family suggests the most conspicuous features—namely, the organization of the numerous small flowers into a compact head, which resembles a single flower, formerly called a 'compound flower.' Among the very numerous forms are arnica, thistle, dandelion, tickseed, beggar-ticks, Spanish needles, ironweed, aster, daisy, goldenrod, rosinweed, sunflower, chrysanthemum, ragweed, cocklebur, ox-eye daisy, tansy, sagebrush, lettuce, etc.

DICTAM′NUS. See Dittany.

DICTATOR (Lat., from *dictare*, to dictate, frequentative of *dicere*, to say). In the earliest times, the name of the highest magistrate of the Latin confederation; and in some of the Latin towns the title was continued long after these towns were subjected to the dominion of Rome. In the Roman Republic the Dictator was an extraordinary magistrate, irresponsible and endowed with absolute authority, whose original name was *magister populi.* The frequency of *crises*, or critical periods, in the quick, aggressive growth of the Roman State, necessitated such an office. The first Dictator (T. Larcius or M. Valerius) was appointed in B.C. 501, nine years after the expulsion of the Tarquins. According to Livy, the immediate cause of this dictatorship was a formidable war with the Latins. In general no one could be appointed Dictator who had not been previously consul, and this condition was very rarely dispensed with. It is possible that the Dictator was originally created or elected by the curiæ, like the kings; but it is more probable that the Senate passed a decree ordering one of the consuls to name or proclaim (*dicere*) a dictator. Originally, of course, the Dictator was a patrician; the first plebeian who filled the office being Marcius Rutilus (B.C. 356), who was nominated by the plebeian consul, M. Popillius Lænas. The dictatorship could not lawfully be held longer than six months; nor was it ever so, except in the cases of Sulla and Cæsar, which were altogether peculiar. It must not be supposed that during a dictatorship the functions of the other magistrates were positively suspended. The consuls and other regular authorities continued to discharge their proper duties, but in subordination to the direction and command of the Dictator, being for the time simply his officers. The superiority of his power, when compared with that of the consuls, appears chiefly in these three points: He was far more independent of the Senate; he had a more extensive power of punishment, without any appeal; and he could not be called to account after his abdication of the dictatorship for anything he had done during the period of his office. The limits of his power were as follows: He could not touch the treasury; he could not leave Italy; and he could not ride through Rome on horseback without previously obtaining the permission of the people. While the consuls had only twelve lictors, the Dictator was preceded by twenty-four, bearing the *secures* and *fasces*. To him also belonged the *sella curulis* and the *toga prætexta.* The last

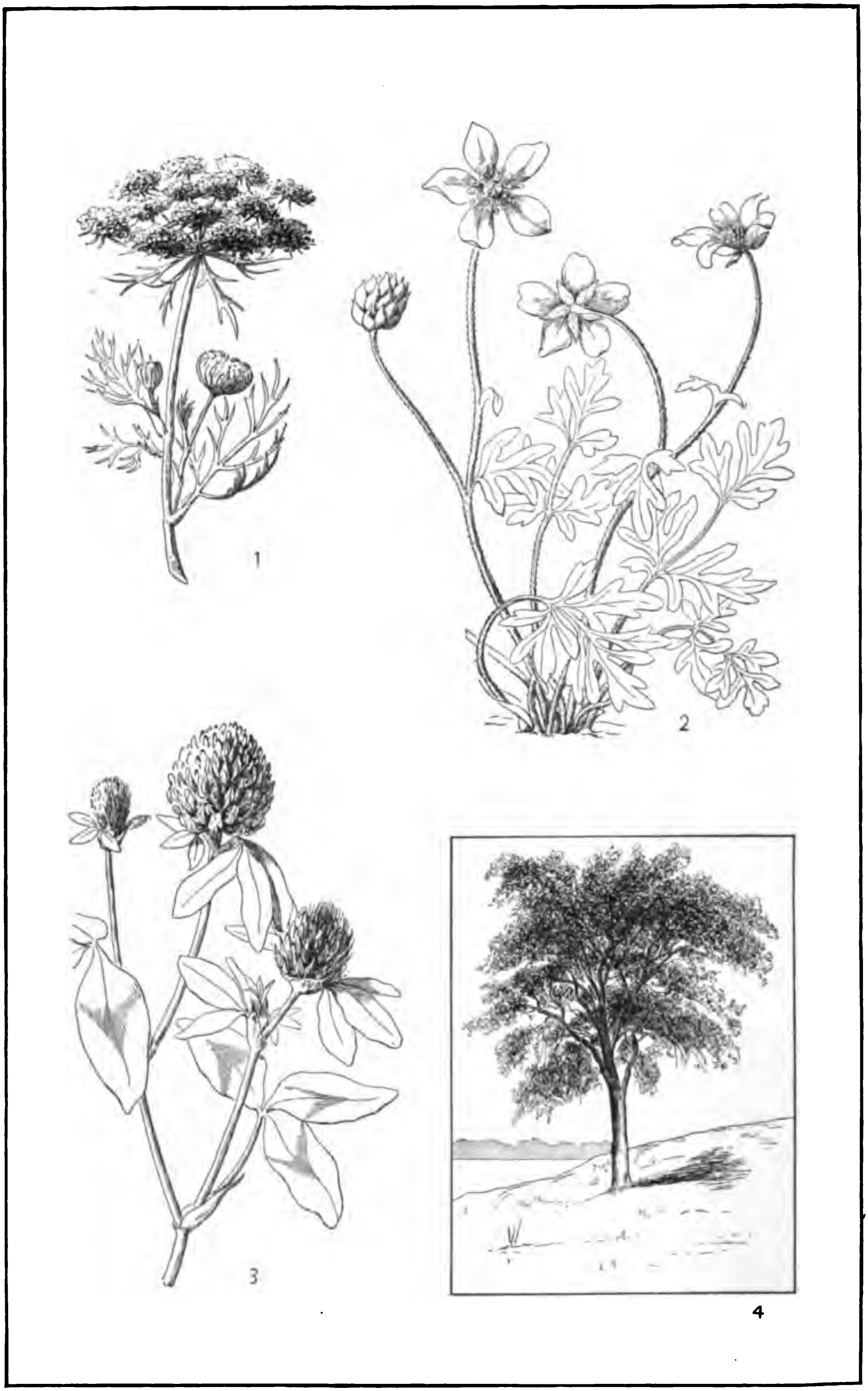
DICOTYLEDONS





1. MORNING-GLORY (Ipomœa sp.).
2. A HEATHER (Cassiope sp.).
3. ARNICA (Arnica sp.); *a*, general habit; *b*, ray-flower; *c*, disk-flower.
4. CATNIP (Nepeta Cataria); *a*, general habit; *b* single flower.

DICOTYLEDONS



1. CARROT (Daucus Carota).
2. BUTTERCUP (Ranunculus sp.).
3. RED CLOVER (Trifolium pratense).
4. ELM TREE (Ulmus sp.).

legally elected dictator was M. Junius Pera, who entered on his office B.C. 216. From this time *nominal* dictators were frequently appointed for the purpose of holding the elections, but even these finally disappeared (B.C. 202). Henceforth, in critical times, a sort of dictatorial power was conferred on the consuls by the Senate by the well-known formula: "That the consuls should see to it that the State should receive no damage." This practice rendered the appointment of dictators no longer necessary. Consult Mommsen, *Römische Staatsrecht*, ii. 133 foll.

DICTIONARY (ML. *dictionarius*, word-book, from Lat. *dictio*, word, from *dicere*, to say). In its original and most common application, a work which is linguistic in character, being a compilation of all or a portion of the words of a language arranged according to some exact order, usually the alphabetical one, with brief explanations and definitions. In later and more elaborate dictionaries additional information of an appropriate character is included within the scope of the work. Thus etymologies, indications of pronunciation, and variations in orthography may be given, while a still further expansion includes citations which illustrate the use of a word. The name is said to have been used for the first time by Joannes de Garlandia, who died in A.D. 1250. He described his book containing a classified list of words as a *dictionarius*. In its use the word dictionary is no longer confined to a simple linguistic compilation, but is applicable to works on special or technical subjects, which through the medium of an alphabetical classification of words belonging to that subject give appropriate and detailed information. These dictionaries on special subjects are very numerous, such as biographical, historical, bibliographical, geographical, philosophical, mathematical, zoölogical, medical, and architectural dictionaries.

The following terms are more or less synonymous with dictionary—vocabulary, which is a list of works restricted to a single work or to some division of the language, e.g. the vocabulary of Cæsar's *Gallic War;* lexicon, a word applied by English-speaking people to a dictionary of some foreign language, as Hebrew, Greek, or Latin; glossary, a partial dictionary of words of a certain dialect or of antiquated or technical terms accompanied by glosses or explanations; thesaurus (verborum), i.e. a treasury of words, an elaborate dictionary with many references and full explanations. More unfamiliar are *idioticon*, from Greek *ἰδιωτικός, idiōtikos*, belonging to an individual, and *onomasticon;* the former, common in Germany, indicates a dictionary of words of a dialect; the latter, from the Greek *ὄνομα, onoma*, name, is a dictionary of names, as the *Onomasticon* of Julius Pollux of the second century—a Greek dictionary in ten books containing words arranged according to their meaning. Index denotes a vocabulary without explanatory matter arranged in alphabetical order, often placed at the close of a book to indicate more exactly and definitely the contents thereof. The gazetteer and concordance should be mentioned as having certain characteristics of dictionaries. The first is a geographical dictionary with names of places, seas, rivers, etc., in alphabetical order, with a brief account of each. The word was used first by Lawrence Echard, whose work was entitled *The Gazetteer; or, Newsman's Interpreter —A Geographical Index* (11th ed., London, 1716). In part ii. the author speaks of his work as "The Gazetteer." A concordance is an index of various passages in a book classified according to certain leading words which are arranged in an alphabetical order. As this was first made for the Bible, Johnson defines it as "a book which shows in how many texts of Scripture any word occurs." Thus, as examples, may be cited: Cruden, *A Complete Concordance to the Old and New Testaments* (London, 1859); Clarke, *Concordance to Shakespeare* (ib., 1827); Brightwell, *A Concordance to the Entire Works of Alfred Tennyson* (ib., 1869).

HISTORY. The earliest dictionary of which there is any mention is that made in Nineveh in the reign of Asshurbanipal in the seventh century B.C., which is impressed on a number of clay tablets in cuneiform letters. Arabic scholars early busied themselves with dictionary-making, a work very necessary for a language as copious as theirs. The first to attempt to gather the entire Arabic vocabulary in one work was probably Khalil ibn Ahmed of Oman (died 791). He adopted an arrangement not alphabetical, but according to certain phonetic and physiological principles. Of Khalil's many successors, Mukarram ibn Mansur, an Egyptian (died 1311), and al-Firuzabadi, a Persian by birth, whose travels, however, entitled him to be called a citizen of the Oriental world (died 1414), may be mentioned. The work of the former (Cairo, 1300 sqq.) filled 20 volumes, and the *Camus* ('dictionary') of the latter, preserved only in part, extended to 60, or, according to some accounts, to 100 volumes. While in a certain sense Hebrew lexicography began with the Massoretic (sixth-eighth centuries), the real production of dictionaries dated from the tenth century, and took its origin and stimulus from the study of Arabic. Rabbi Saadia Gaon (died 942) was the first lexicographer; David Kimchi (c.1200), author of the *Book of Roots*, was the greatest. Menahem ben Sarug (c.960) made a dictionary arranged according to stems. Judah Hayyuj (c.1000) propounded the theory of triliteral roots, and his work was continued by Rabbi Jonah (Ibn Janah, c.1030). Sanskrit dictionaries begin at a very early date in the glossary of Yaska to the Rig-Veda (about the fifth century B. C.), and they continue to be for the most part collections of rare words and meanings, being designed especially for the authors who composed the artificial poetry which is so prevalent in India. These dictionaries, the most of which were written after the fifth century A.D., are invariably in verse, and are divisible into the two general classes of lexicons of synonyms and homonyms. Alphabetic arrangement begins only in the latter period of the homonymous dictionaries. The older works of this class arrange the words in order of importance, while the synonymous dictionaries are classified according to subjects. Other modes are according to number of syllables in the word, its gender, or its final letter. The number of native Sanskrit lexicons is over fifty, and of them the Amara-kōśa (q.v.) is the most frequently quoted. There are also special dictionaries on botany, medicine, and astronomy, as well as Buddhistic glossaries in Pali, and polyglot lexicons in Sanskrit, Tibetan, Mongolian, and even Chinese. (See Zachariæ, *Indische Wörterbücher*, Strassburg, 1897.) Of Old and Middle Iranian (Avestan and Pahlavi) there are but two native dictionaries, one Avestan-Pahlavi, and the other Pahlavi-Pazand (both edited by Haug and Jamaspji, Bombay and London, 1867-70, the former also by Reichelt, Vienna, 1900). In Modern Persian there is a long list of lexicons, both general and special, which are based upon Arabic models, the oldest one, perhaps, written by Asadi, Firdusi's teacher, dating from the eleventh century. In the classical languages, Greek and Latin, we find evidences of lexicographical work at an early period. Dictionaries of language in a form with which we are familiar are of modern origin. They are an outgrowth of the importance of Greek and Latin literature to the scholars of the Middle Ages, and may be traced to the mediæval custom of inserting marginal glosses or explanatory words in texts of classical authors. The bilingual dictionary in particular is due to the closer intercourse of the various nations of the more modern world. The Greeks and Romans did not conceive of a work containing all the words of their own or of a foreign language, and their early dictionaries were simply glossaries of unusual words or phrases. Athenæus tells of Alexandrian scholars such as Zenodotus, librarian of the great library, who compiled books containing foreign phrases and a glossary of Homer; and of Artemidorus of B.C. 240, who prepared a book of technical terms on cooking. Both have been lost. According to Suidas, Apollonius, the Sophist of the days of Augustus, wrote the earliest Greek lexicon, which was entitled Λέξεις 'Ομηρικαί, (*Lexeis Homērikai*), or *Homeric Words*, published last by Bekker, of Berlin, 1833. This is the most ancient extant. Other Alexandrian lexicographers were Ælius Mœris (A.D. 190), the Atticist, who wrote a Greek (Attic) lexicon (edited by Hudson, Oxford, 1712), and Harpocration (fourth century), who composed a lexicon of the Attic orators (edited by Dindorf, Oxford, 1853).

Ammonius, professor of grammar at Alexandria, prepared a book of homonyms, published by Valckenaer in 1739 (also Leipzig, 1822). In this same book is edited the work of Zenodotus on the cries of animals, which is similar to Vincento Caralucci's *Lexicon Vocum quæ a Brutis Animalibus Emittuntur* (Perugia, 1779). Hesychius, of the latter part of the fifth century A.D., wrote a lexicon containing short explanations of Greek words with quotations from authors. The first edition is the Aldine (Venice, 1514), the latest that of Schmidt (Jena, 1867). Orion, of Thebes, Egypt, of about the same period, wrote an etymological dictionary, which was printed last in 1820 at Leipzig by Sturz. Erotian, a physician of Nero, prepared a lexicon on Hippocrates arranged in alphabetical order by a later writer, edited by Klein, Leipzig, 1865. Julius Pollux, of Naucratis, Egypt, who was made professor of rhetoric at Athens by the Emperor Commodus, wrote the *Onomasticon* referred to above, which is a work of great value for the language and for the study of antiquities. It first appears in the Aldine edition (Venice, 1500). There is an edition by Dindorf (Leipzig, 1824). The most famous of Greek writers of glossaries is Suidas, whose period is thought to be the tenth century A.D. He prepared an alphabetical dictionary of words, with place and personal names and many quotations from Greek writers and scholars. This book was first printed at Milan in 1499 and again in an excellent edition by Bernhardy, Halle, 1853. Other Byzantine lexicographers are Photius of the ninth century (edition by Naber, Leyden, 1864), and John Zonaras of the twelfth century (edition by Tittmann, Leipzig, 1808). Gaisford, at Oxford, published in 1848 a Greek glossary of the eleventh century known as *Etymologicum Magnum*, which contains many passages from different writers and many references of an historical and mythological character. Eudocia Augusta, of Macrembolis, wife of Constantine XI. and Romanus IV. (1059-71), prepared an historical and mythological dictionary which she called 'Ιωνία, *Iōnia*, Bed of Violets. In the work of Crastoni, a native of Piacenza, we have the first Greek and Latin lexicon. There is an Aldine edition of 1497. To the same time belong Guarina's *Thesaurus*, and that of Thomas, known as the monk Theodolus. In 1572 at Geneva appeared the *Thesaurus Græcæ Linguæ* of Henri Estienne (Stephanus), reëdited by Dindorf at Paris, 1865, the most complete Greek lexicon published. The first Greek-English lexicon is that of John Jones, London, 1823, although the work of John Pickering, which was incomplete, dates in 1814. The most useful Greek-English lexicon is the Liddell and Scott (8th ed., New York, 1897), also in abridged form. Pape, *Wörterbuch der griechischen Eigennamen* (Brunswick, 1875-80) is of value for proper names. Special Greek lexicons worthy of mention are: *Greek-English Lexicon of the New Testament*, by J. H. Thayer, a revision of Grimm's Wilke's *Clavis Novi Testamenti* (London, 1889); *Greek Lexicon of the Roman and Byzantine Periods*, by E. A. Sophocles, revised by J. H. Thayer (ib., 1887), and for modern Greek, Λεξικὸν 'Ελληνοαγγλικόν, Modern-Greek-English and English-Modern-Greek, by Contopoulos (3d ed. Athens, 1889).

In Latin lexicography we think first of M. Terentius Varro, who wrote *De Lingua Latina*, a work on etymology and the uses of words, then of Verrius Flaccus, living in the days of Augustus, who wrote *De Verborum Significatu*, which is extant in the compilation of Pompeius Festus, entitled *De Significatione Verborum*, which was abridged by Paulus Diaconus of the eighth century. The words are arranged alphabetically. This work has been of great service in giving information on antiquities and grammar. Less familiar are the dictionary of Papias of the eleventh century based on glossaries of the sixth and seventh, and the *Catholicon* or *Summa* of Giovanni Balbi, dating about 1286 and now a curiosity as printed by Gutenberg in 1460. It passed through twenty editions. The earliest polyglot was the work of an Augustine monk, Colepino, dating at Reggio 1502. At first it was a Latin-Greek lexicon, then extended to include Italian, French, and Spanish, and finally in the edition at Basel in 1590 there were eleven languages. The great Latin dictionaries are *Thesaurus Linguæ Latinæ* of Robert Estienne (Paris, 1531), reëdited down to 1734; and the *Totius Lexicon Latinitatis* by Forcellini (Padua, 1771, this edition being published with the names of Facciolati and Forcellini as editors; 3d ed., 1831). The Latin words are given Greek and Italian equivalents, and are illustrated by examples from classical literature. The latest (fifth) edition is that of De Vit (Prato, 1858-79), with the *Onomasticon Totius Latinitatis* as a supplement. This is the greatest of all Latin lexicons. The first Latin-English lexicon of any account was edited by Sir Thomas Elyot (London, 1538; 3d ed. 1545). Before this there had appeared the *Promptorium Parvulorum* by Galfridus Grammaticus (1499), the *Medulla Grammatica* in manuscript (1483), and the *Ortus* (*garden*) *Vocabulorum* of Wynkyn de Worde (1500). Then in 1552 a Richard Huloet published his *English-Latin Abecedarium* with English definitions, and in 1570 appeared *Manipulus Vocabulorum Puerorum*, a rhyming dictionary of English and Latin words by Peter Levins, and finally the *Alvearie* by John Baret, which had three languages, English, Latin, French. In 1736 Robert Ainsworth published his Latin-English dictionary, which passed through many editions. The best Latin lexicons of to-day are: *Latin-English Dictionary*, White and Riddle (London, 1880), and *English-Latin Dictionary* (ib., 1869); Harper's *Latin Dictionary*, which is based on Freund's *Latin-German Lexicon*, in English, by Andrews (New York, 1856), and which is revised by Lewis and Short (ib., 1886); Georges, *Deutsch-Lateinisches und Lateinisch-Deutsches Wörterbuch* (4 vols., Leipzig, 1880-85). This last is most accurate and satisfactory and next to the Forcellini contains the most words of any Latin lexicon. The greatest Latin lexicon of modern times is the *Thesaurus Linguæ Latinæ* (Leipzig, 1900 et seq.), which is due mainly to the genius of Edward Wölfflin of Munich. It is edited, under the supervision of the five great German academies, by the most distinguished classical scholars of Germany. It has reached—in 1902—360 pages, and the word last treated is *artus*, a fact which shows the great scope of this work. For mediæval Latin the only lexicon of importance is the Du Cange, *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis* (1733-36, edited by Henschel; 16 vols., Paris, 1882-88).

English Dictionaries. The earliest work on lexicography in England was directed to the extension of our knowledge of Latin. To such a purpose are due the Latin-English dictionaries of the latter period of the fifteenth century and the beginning of the sixteenth, which are mentioned above. With a similar purpose, Minsheu published in 1617 his great polyglot *Guide to the Tongues*, explaining English words by those from ten foreign languages. The *English Expositor* of John Bullokar (1616) was the first English dictionary in the strict sense of the term, as it gave both words and definitions in English. In the seventeenth century we find the dictionary of Henry Cockeran (1623), the *Glossographia* of Thomas Blount (1656); Phillips, *The New World of English Words* (1658); and Elisha Coles's *English Dictionary* (1677). In the early part of the eighteenth century there appeared the first dictionary which attempted to give a complete collection of words of the language, the *Universal Etymological English Dictionary* of Nathan Bailey (1721). In his preface to the first volume the author declares that he is the first to attempt in English to trace the derivation of English words on a large scale, although he refers to the work of Blount in his *Glossography* and Skinner in his *Etymologicon* (1671). He also marked accents to aid in pronunciation. Bailey's dictionary passed through twenty-four editions before the close of the century and was the standard until the publication of Johnson's Dictionary. In 1755 Dr. Samuel Johnson published, after seven years of labor, his famous dictionary. This was a most remarkable achievement and was epoch-making in the history of the language, for it determined the form, meaning, and use of English words. Dr. Johnson also introduced the custom of illustrating the use of words by quotations from the best writers. Whatever is said on the etymological side belongs to that time and is not in accord with present knowledge. This work passed through many editions, of which the last is that of Robert Gordon Latham (London, 1866), which is not of any great value to-day save from an historic point of view. Johnson's Dictionary simply imitated Bailey's in the use of accents to indicate pronunciation. The first dictionary which gave attention to orthoëpy is that of Kenrick (London, 1773), likewise Perry, *Royal Standard English Dictionary* (Boston, 1777), and the *Complete Dictionary of the English Language* by the famous elocutionist, Thomas Sheridan (London, 1780). The object of this work is stated to be "to establish a plain and permanent standard of pronunciation." In 1791 John Walker published *Critical Pronouncing Dictionary and Expositor of the English Language.* In this work pronunciation is the main object, and the author declares his design to be "to give a kind of history of pronunciation and to register its present state." This dictionary has had a wide circulation and has a reputation to-day, although it is not a reliable guide for the pronunciation of the present time, but rather supplies information as to the pronunciation at the beginning of the nineteenth century. In 1836 B. H. Smart published his *New Critical Pronouncing Dictionary of the English Language.* This is also designated "Walker Remodelled." The *New Dictionary*, by Richardson, published also in London, 1836 (new ed., New York, 1863), is valuable for many citations from authors in chronological arrangement, which, however, have unfortunately been abridged in the later edition. The *Imperial Dictionary of the English Language* by John Ogilvie (London, 1850) is an encyclopædic lexicon, literary, scientific, and technological. A new edition by Charles Annandale dates in 1883. This formed the model of the *Century Dictionary*, mentioned below. Similar to the *Imperial Dictionary* is the *Encyclopædic Dictionary* by Robert Hunter (London, 1879-88). In 1806 Noah Webster published his *Compendious Dictionary* and in 1828 he brought out his great *American Dictionary of the English Language*, which was followed by abridged editions. Besides many editions containing minor changes complete revisions of the large dictionary were made in 1847 by Chauncey A. Goodrich and in 1864 and 1890 by Noah Porter. This last revision is entitled *Webster's International Dictionary.* It has an appendix with valuable tables, e.g. a pronouncing biographical dictionary and pronouncing gazetteer. An extensive Supplement of 25,000 words edited by W. T. Harris was added in 1900. The Webster dictionaries were the initial works in lexicography in the United States. *The*

Dictionary of the English Language, by Joseph E. Worcester, dates from 1859, and was last revised in 1881, so that it is now largely out of date. The last edition (1886) contained a supplement of 12,500 words. The introduction contains a History of English Lexicography and a Catalogue of English Dictionaries. In 1898 appeared the *Webster's Collegiate Dictionary* (an 8vo abridgment from the *International*), and later editions of the *International* with a Supplement (1900) of 25,000 words, under the direction of Dr. W. T. Harris, with F. Sturges Allen as chief-of-staff, and with (1902) a new gazetteer and biographical dictionary. The octavo dictionary edited by Rev. James Stormonth is especially esteemed for its careful work in pronunciation. In 1889-95 appeared *The Century Dictionary*, an encyclopædic English lexicon of 7046 pages, based upon *Ogilvie's Imperial Dictionary* (mentioned below) and prepared under the direction of Dr. W. D. Whitney, with Benjamin E. Smith as chief-of-staff, together with an added *Dictionary of Proper Names* of 1085 pages, edited by B. E. Smith, and a geographical atlas. In 1893-95 appeared the large one-volume (2 vols. when first published) *Standard Dictionary of the English Language*, under the editorship of Isaac K. Funk and Francis A. March. The great work, *A New English Dictionary on Historical Principles*, founded mainly on material accumulated by the English (British) Philological Society, was at first edited by James A. H. Murray, but later there have been associated with him Henry Bradley and W. A. Craigie. It is the greatest of all dictionaries in its fulness of illustration by citations and elaborate analysis of the meanings and etymologies of the words treated. It will be completed about 1914 if the same rate of progress is maintained as for some years past, being now (1907) finished practically to S. It is strongest in literary and etymological matters, and covers systematically the period from 1200 A.D. to date.

There are many dictionaries on special subjects, and the number of them is rapidly increasing, both in English and many of the foreign languages. Some of the more important special dictionaries in English are: ARCHITECTURE AND BUILDING—Sturgis, *Dictionary of Architecture and Building* (1901-2). BIBLE—*Dictionary of the Bible*, by James Hastings (5 vols., 1898-1904); T. K. Cheyne and J. S. Black, *Encyclopædia Biblica* (4 vols., 1899-1903). BIOGRAPHY—Appendices to *Webster's International Dictionary*, *Standard Dictionary*, and *Century Dictionary;* Stephen (1882-91) and Lee (1891-1901), *Dictionary of National Biography* (63 vols., 8vo, London, 1883-1901), and *Index and Epitome* of this (London, 1903); Adams, *Dictionary of Authors* (New York, 1898); *Who's Who; Who's Who in America;* in German, *Wer Ist's* (these last three being revised annually); Thomas, *Universal Pronouncing Dictionary of Biography and Mythology* (3d ed., 2 vols., 8vo, Philadelphia, 1901). BIRDS—Newton and Gadow, *Dictionary of Birds* (1893). CHEMICALS AND CHEMISTRY—G. H. Hurst, *Dictionary of Chemicals and Raw Products used in Manufacture of Paints, etc.* (1901); A. I. Cohn, *Dictionary of Tests and Reagents* (1903); Watts, *Dictionary of Chemistry* (4 vols., 2d ed., 1888-94); Thorpe, *Dictionary of Applied Chemistry* (3 vols., 1894-95); Rawson, Gardner, and Laycock, *Dictionary of Dyes and Mordants* (1901). DIALECTS—Wright, *The English Dialect Dictionary* (1898-1905), including a grammar of English dialects (a quarto work in 6 large volumes). This, like the *Oxford English Dictionary*, is the most complete dictionary of its kind ever published. It is founded on the publications of the English Dialect Society and a large amount of new material gathered from new contributors and voluntary readers throughout Great Britain and Ireland. It contains a very complete vocabulary of all dialect words or senses now in use or known to have been in use since the beginning of the eighteenth century, with copious illustrative citations; Bartlett, *Dictionary of Americanisms* (1877); Farmer, *Americanisms, Old and New* (New York, 1899) (these last two both very incomplete). ECCLESIASTICAL SUBJECTS—Addis and Arnold, *A Catholic Dictionary* (6th ed., London, 1903); Hook, *A Church Dictionary* (15th ed., London, 1896). GEOGRAPHY AND PLACE NAMES—Heilprin, *Lippincott's Gazetteer of the World* (2d ed., large 8vo, Philadelphia, 1906); Chisholm, *Times* (London) *Gazetteer* (reissue, London, 1899); Blackie, *Dictionary of Place Names*, with derivations (London, 1887). MEDICAL—Gould, *Medical Dictionary* (New York, 1898, supp. 1904); Dunglison ed., *Medical Dictionary* (3d ed., New York, 1903); Harris, *Dictionary of Dentistry* (New York, 1899). MUSIC—L. C. Elson, *A Dictionary of Music* (Boston, 1905); Grove, *Dictionary of Music* (2 ed., 4 8vo vols., 1904-7). MYTHOLOGY—*Harper's Dictionary of Classical Literature and Antiquities* (New York, 1898); J. Dawson, *Dictionary of Hindu Mythology*, etc. (London, 1903). MILITARY AND NAVAL—J. P. Wisser and H. C. Gauss, *A Military and Naval Dictionary* (New York, 1905). NEEDLEWORK—Caulfield and Saward, *Dictionary of Needlework* (London, 1885). PHILOSOPHY AND PSYCHOLOGY—Baldwin, *Dictionary of Philosophy and Psychology* (2 vols., 8vo, New York, 1901-2); in French, Pierre Nova, *Dictionaire de terminologie scolastique* (Paris, 1885; out of print). ECONOMICS—Palgrave, *Dictionary of Political Economy* (4 vols., 8vo, London, 1894-1901). PROPER NAMES IN FICTION, HISTORY, etc.—Harbottle, *Dictionary of Historic Allusions* (London, 1903); Adams, *Dictionary of the Drama* (1st vol., New York, 1904). QUOTATIONS—Dalbiac, *Dictionary of German Quotations* (London, 1906); Harbottle and Dalbiac, *Dictionary of French and Italian Quotations* (London, 1901); Harbottle, *Dictionary of Classical Quotations* (London, 1897). SLANG—Farmer and Henley, *Dictionary of Slang and Colloquial English* (London, 1905). This is a one-volume abridgment of the larger work "Slang and its Analogues," edited at first by John S. Farmer, later by him and W. E. Henley, as joint editors, containing many illustrative citations (7 vols., 1890-1904). SYNONYMS—Crabb, *English Synonyms* (1st edition, London, 1816). This work contains a considerable body of selected citations and has extended discriminations between words that are more or less synonymous. It has passed through many editions practically unchanged, and though not a scholarly work, is still the best book of the kind that there is for English synonyms. Based upon it, and largely taken from it, is Smith's *Synonyms Discriminated* (4th ed., London, 1890), a book of the same general character. Other dictionaries of synonyms, without citations, and consisting essentially of mere lists of words more or less related in meaning are: Raget, *Thesaurus* *of English Words and Phrases Classified* (1st ed., London, 1852); Soule, *Dictionary of English Synonyms* (New York, 1871, 1891); Fernald, *English Synonyms and Antonyms* (1896). The best treatments of English synonyms at present are those contained in the larger dictions (the *International*, the *Standard*, and the *Century* dictionaries.) TECHNOLOGICAL—Goodrich and Tweeney, *Technological and Scientific Dictionary* (London, 1905).

The best dictionaries from English into foreign languages and vice versa, and the dictionaries entirely in foreign languages will be found in the bibliographies given under the various special articles in this Encyclopædia; thus, under the article PORTUGUESE LANGUAGE will be found a list of the best native and bilingual dictionaries of Portuguese; and the case is similar with other like articles, such as SPANISH LANGUAGE, ITALIAN LANGUAGE, etc. It is worth while to mention specially here, however, one or two of the greater dictionaries in foreign languages. Among these is the great German dictionary, *Deutsches Wörterbuch*, of Jacob and Wilhelm Grimm, begun in 1852, of which the first volume was published in 1854. It aims to give the words only of the literary language (being far less full than the *Oxford English Dictionary*), from the beginning of the sixteenth century. There are now (1907) published nine complete volumes and three partially finished. Since the death of the Grimm Brothers the work has been carried on by other scholars. Two great French dictionaries also call for notice. One is the *Dictionnaire de la langue française*, by M. P. E. Littré, a large quarto rich in literary citations and the history of French words. It was published in Paris 1863-72, and a supplement 1878-82. The other is the grand *Dictionnaire universelle du XIXème siècle* (15 vols., 4to) of Larousse, published at Paris 1866-76. This is perhaps more properly an encyclopædia, since it contains essays of some length upon various subjects. In the revised edition, published under the title *Nouveau Larousse illustré* in 7 volumes (Paris, 1901-2), under the editorship of Claude Augé, there is less of the discursive treatment and a greater variety of articles covering the entire field of knowledge, combining fiction, history, biography, geography, dictionary of words, etc., all in one general vocabulary.

Among the modern dictionaries in two or more languages those treating of technical terms are of special interest. There are now numerous dictionaries of this class, many of them having a vocabulary in three languages, especially German, French, and English. The definitions are usually merely by synonyms or the briefest kind of description, their purpose being to meet the needs of the technological or scientific student. A recent dictionary of this class is the *Technological Dictionary*, edited by Alexander Tolhausen, published in 1901 at Leipzig, in three thick duodecimo volumes. The vocabulary is in German, French, and English, respectively, in the three volumes.

The form and contents of the modern dictionary are the outcome of long experience. The first dictionaries were mere word lists arranged according to subjects or even miscellaneously. The alphabetic arrangement is comparatively recent and has entirely replaced the older ones. The giving of scientific etymologies and the observance of the historic development in the order of definitions, now typical of the best dictionaries, first began to take definite shape in the work of Noah Webster. The use of illustrations in dictionaries is old, but in general only those illustrating the mechanical arts were reliable for scientific accuracy. The general and free use of illustration of animals and plants with a reasonable approach to accuracy dates from the publication about 1850 in England of a revision of *Webster's Dictionary* under the name of *Ogilvie's Imperial Dictionary*. This was copiously illustrated, and many of its illustrations still find a place in the standard dictionaries of to-day. The most notable general English dictionary with illustrations prior to Ogilvies was that entitled *Dictionary of Arts and Sciences* (2 vols., 4to, London, 1806), by G. Gregory. The work is profusely illustrated with steel engravings of the arts and sciences and natural history, and combines the features of a dictionary and an encyclopædia. The illustrations in natural history, however, lack the scientific accuracy that is characteristic of modern dictionaries and encyclopædias. The dictionary of to-day is also typified by being a composite work produced by special and general editors working under a chief-of-staff, or managing editor, the whole work being subject to the direction of an editor-in-chief.

DICTUM (Lat., a saying, utterance, response of an oracle), sometimes called *obiter dictum*, i.e. an opinion pronounced 'by the way.' In legal parlance, an unauthoritative expression of opinion on a point of law uttered by a judge in a judicial proceeding. In a legal system based, as is that of England and America, largely upon precedent, only so much of a judicial opinion as is directly concerned with the decision of the case in hand has commanding authority. This is due to the fact that the courts have no power to decide cases not before them for adjudication. The principle of *stare decisis*, that is, of abiding by a rule once settled by a formal decision, invests such a decision with the force of law, and makes it a binding authority upon the courts in similar cases. But a decision upon a collateral point, or upon a state of facts not before the court for its determination, has no such binding force. It is a mere pronouncement, or expression of opinion, which derives its authority solely from the learning and personal weight of the judge declaring it. It is usual, therefore, to distinguish between the 'law of a case' and the *dicta*, or judicial opinions expressed in it, which, however important and influential they may be, have not the force of law. This process of 'sifting' the law from the *dicta* of a judicial opinion is one of the chief, as it is one of the most difficult, functions of the lawyer and the judge.

It is not to be inferred, however, that judicial *dicta* are entirely without legal authority. The opinions of eminent and learned judges have the same weight with the courts as that which attaches to the disinterested opinions of great lawyers and legal writers, and are classified as having 'persuasive' as distinguished from 'imperative' authority. It is often desirable and sometimes necessary to resort to such opinions as an aid to the formation of a sound though independent judgment upon a question of law, and many cases have been decided and many important legal doctrines established in deference to such authority. In this view of the matter, judicial *dicta* constitute a long and valuable series of commentaries on the law of the land, scattered through the law reports, to which resort may be had as to the more systematic writings of eminent lawyers and judges, as those of Coke, Blackstone, Kent, and Story. (See JUDGMENT; OPINION.) Wambaugh, *The Study of Cases* (2d ed., Boston, 1894).

DICTUM OF KENILWORTH. An agreement between Henry III. and the rebellious barons, so called because made during the siege of Kenilworth, in 1266.

DIC′TYNI′IDÆ (Neo-Lat. nom. pl., from Gk. *δίκτυον*, *diktyon*, net + *εἶδος*, *eidos*, form). A family of spiders that weave irregular webs in which two kinds of silk are used. See SPIDER.

DIC′TYONE′MA (Neo-Lat., from Gk. *δίκτυον*, *diktyon*, net + *νῆμα*, *nēma*, thread). A genus of fossil graptolites in which the colony, when found pressed out on the surface of a slab of shale, has the appearance of a network of delicate filaments made up of heavier cell-bearing branches that radiate from a common base and are united at frequent intervals by slender horizontal threads. The genus ranges from the uppermost Cambrian to the lower Devonian rocks, and is especially abundant in upper Cambrian 'Dictyonema shales,' which form such a persistent zone just below the Ordovician system in the Baltic Provinces, Scandinavia, England, and Eastern Canada. Dictyonema flabelliforme, the best-known species, had a colony five to ten inches long that grew in the shape of a funnel from a single rootstock. See GRAPTOLITE.

DIC′TYOSPON′GIDÆ (Neo-Lat. nom. pl., from Gk. *δίκτυον*, *diktyon*, net + *σπόγγος*, *spongos*, sponge). A family of usually large, fossil lyssacine sponges somewhat closely allied to the existing grass-sponges (Euplectella), and found in rocks of Lower Devonian to Lower Carboniferous age, but chiefly in those of Upper Devonian age in New York State. In form these sponges vary from ovate, cylindrical, and prismatic to funnel-shaped. They have a large central cavity, and thin walls in which the siliceous spicules formed a skeleton of great regularity, so that the surface of the fossil is ornamented by a network of fine rectangular meshes. As the sponge substance itself was decomposed and the siliceous spicules dissolved during the processes of fossilization, these organisms appear at present as casts of the original organic matter, imbedded in shaly sandstones, and their structure is indicated by the impressed lines upon their surfaces, and in some cases by the iron oxide (limonite) which occupies the cavities once filled by organic tissue or spicules. Some of these sponges have very simple form with smooth surface; others are radially or transversely ribbed, and still others are spiny or nodulose, while a few have pouched nodes upon their surfaces.

In the region where these fossil sponges have been found in greatest abundance—namely, in Allegany, Cattaraugus, and Steuben counties of New York State—they occur in sandy shales or sandstones in such manner as to indicate that they lived often in extensive colonies on sandy or muddy bottoms, and they are not as a rule associated with any considerable number of other kinds of fossil organisms. The earliest species, Dictyospongia Danbyi, from the Upper Ludlow rocks of England, has a simple, subovate form. The more ornamented forms appear in the Upper Devonian and Lower Carboniferous rocks. The principal genera are Dictyospongia, Uphantænia, Hydnoceras, Prismodictya, and Thysanodictya of the Chemung rocks, and Phragmodictya and Physospongia of the Keokuk group of Lower Carboniferous age. About 200 species are known, of which number scarcely more than half a dozen are European. An elegant monograph, with fine lithographic plates of these fossil sponges, was published by James Hall and J. M. Clarke as "A Memoir on the Paleozoic Reticulate Sponges of the Family Dictyospongidæ," in *Memoirs of the New York State Museum of Natural History*, vol. ii. (Albany, 1898). See SPONGE; SPONGIOZOA.

DIC′TYS (Lat., from Gk. *Δίκτυς*, *Diktys*) OF CRETE. A Greek writer. He was supposed to have been a companion of Idomeneus in the Trojan War, of which he wrote an account. The Latin version (dating from the fourth century A.D.) of this fabulous history is alone extant. It has been maintained that no Greek original ever existed; but it now seems clear that this view is incorrect, and that the Greek version was used by Malalas in his chronography (c.570 A.D.) and by other Byzantine writers. The prologue of the Latin version and Suidas inform us that the original work of Dictys was written in Phœnician letters on bark and buried with him at Cnosus, in Crete, but in the thirteenth year of Nero's reign (A.D. 66) the tomb was burst by an earthquake and the Phœnician book thus discovered. This was then presented to Nero, who ordered it translated into Greek. The Latin version bears the name of one Septimius as its author. The work belongs to the body of fictitious literature which began to be written in the Hellenistic period. In the Middle Ages it was much read, and, with the spurious history of Dares the Phrygian (q.v.), became the source of romance. The best edition is by Meister (Leipzig, 1873).

DICYC′LIC PLANTS. See BIENNIALS.

DICYNODON, dī-sī′nō-dŏn (Neo-Lat., from Gk. *δι-*, *di-*, double + *κύων*, *kyōn*, dog + *ὀδούς*, *odous*, tooth). A genus of fossil reptiles found in the Permian-Triassic rocks of South Africa and Central India. The animal was a land reptile of heavy build, with large, massively constructed limbs that were adapted to walking. The skull, which attained a length of 18 inches, is massive and peculiarly shaped. The orbits or eye-cavities are large, and there is a pineal foramen which marks the presence in the live animal of a 'pineal eye,' perhaps beneath the skin in the midde of the forehead. The only teeth present in the skull of this animal are a pair of upper incisors which have been developed to extraordinary size to form tusks resembling those of the walrus. The premaxillary bones of the skull and the anterior ends of the mandibles or lower jaws are furnished with heavy cutting edges to make a formidable horny beak like that of the turtles. No complete skeleton of Dicynodon has yet been found, but the fragments collected show it to be an animal of great interest, and it is considered by some paleontologists to belong to what is called a synthetic group of reptiles from which the mammals are supposed to have been evolved. Relatives of Dicynodon that do not have the prominent incisor tusks are found in the Triassic beds of Scotland. See STEGOCEPHALIA; THEROMORPHA.

DIDACHE, dĭd′ȧ-kē̇. See TEACHING OF THE TWELVE APOSTLES.

DIDACTIC POETRY. That kind of poetry which aims, or seems to aim, at instruction as its object, making pleasure entirely subservient to this. It has been disputed whether the existence of a kind of poetry especially entitled to the name didactic consists with the very nature and object of the poetic art. For it is held that to point out instruction as the peculiar object of one kind of poetry is to overlook the high aim of all poetry, and that a poem may be in the highest sense ethical without any obvious aim at instruction. The drama of Shakespeare has an immense ethical or moral value, but it is not didactic. Examples of purely didactic poetry are Vergil's *Georgics*, Horace's *Ars Poetica*, Pope's *Essay on Criticism* and *Essay on Man*.

DIDAPPER, dĭ′dăp-ẽr, BEAU. A poor-spirited weakling in pursuit of Fanny in Fielding's *Joseph Andrews*.

DIDEL′PHIA (Neo-Lat., from Gk. *δι-*. *di-*, double + *δελφύς*, *delphys*, womb), or METATHERIA. The second of the three great subclasses of mammals (q.v.), containing only the single order Marsupialia (q.v.). The name is derived from the 'double' condition of the womb in the female, where the uterine dilatations of the oviducts continue through life distinct from each other. There are also two vaginæ, each with its own opening into the cloaca, into which the rectum and ureters likewise open. There is no well-developed placenta, and it is generally entirely wanting, though it is now thought that its absence is a secondary condition and not primitive, as it has been shown to be present in the early stages of development in the bandicoots (*Perameles*).

DIDEROT, dē̆′d'-rō̆′, DENIS (1713-84). One of the most brilliant, versatile, and prolific writers of the French 'philosophic' generation. He was born at Langres, October 5, 1713, and was educated by the Jesuits. He declined to study medicine or law, quarreled with his family, and eked out a meagre livelihood in young manhood by literary hack work and teaching mathematics. After several discreditable bohemian adventures, he married (1743), and became definitely estranged from his father. In this year he published translations of Stanyan's *History of Greece*, and in 1746 a translation of James's *Dictionary of Medicine*, with an *Essai sur le mérite et la vertu*, a paraphrase of Shaftesbury. The *Pensées philosophiques* of this year was his first independent work, and is said to have been inspired by a caprice of his mistress, Madame de Puisieux, who certainly prompted his anonymous and most indecent novel, *Les bijoux indiscrets* (1748), of which he is reported to have said later that he "would cut off an arm not to have written it," though he was never squeamish in fiction. Diderot's first work of philosophic importance is the *Lettre sur les aveugles à l'usage de ceux qui voient* (1749), which, though apparently a hypothetical study of the philosophy of sensation, really involved an undermining of ethical standards and so of social order. This essay abounds in strange previsions of later discoveries and hypotheses. Its immediate result was the imprisonment of its author at Vincennes—not because of its audacity, but because a passage in it offended a lady of great though unavowable influence, Madame Dupré de Saint-Maur. From imprisonment Diderot was released at the urgency of the publishers who had undertaken to bring out the famous *Encyclopédie*, originally conceived by Diderot as an enlargement of *Chambers's Encyclopædia* (1727), but becoming, under his editorship and, for a time, that of D'Alembert, the organ of intellectual emancipation rather than of any school of ethics or philosophy. To this Diderot gave twenty years of unremitting labor, writing, revising, editing, correcting, supervising, and combating the intrigues and threats of theological opponents and the prohibitions of a censorship that, fortunately for his publishers, was venal as well as corrupt. The *Encyclopédie* counts twenty-eight volumes (1751-72), with a six-volume supplement (1776-77) and two volumes of tables (1780). It was not primarily or chiefly revolutionary, but practical. All branches of science, manufacture, and agriculture were treated with great fullness. It is only occasionally, and then often by mocking insinuation rather than direct attack, that it touches religion or morals, in which it has no consistent theory to uphold. The attacks on legal abuses and feudal survivals are quite as marked a feature. The work was greeted with immense enthusiasm and was hardly in print before it was out of it. The last sets brought the price of a rarity, and it was several times reprinted. Diderot had during brief intervals of repose in this herculean work found opportunity to compose two plays—*Le fils naturel* (1757) and *Le père de famille* (1758)—that mark the beginning of the modern domestic drama, and by his critical *Paradoxe sur le comédien* had great influence on Lessing, and so on the German stage. The French classic tragedy had confined itself to 'noble' themes. Diderot took his tragic situations from every-day middle-class life. To this period belongs also an essay on painting in the *Encyclopédie*, which Goethe translated, adding a luminous commentary; his posthumously published novel, *La Religieuse* (1759); the eccentric *Jacques le fataliste* (1773), also posthumous; and the yet more eccentric *Le neveu de Rameau*, which first appeared in print in a translation by Goethe (1805). Diderot wrote also three short stories and nine *Salons*, critiques beginning in 1759 on the annual exhibition of painting, and unsurpassed in their untechnical and suggestive freshness. In 1773 Diderot, who had received but $600 a year for his work on the *Encyclopédie*, felt constrained to sell his library. It was purchased by Catharine II., and presented to him as salaried caretaker. He went to Saint Petersburg to thank the Empress, and spent some months there in her intimate society. He returned in 1774 and passed his last decade in ephemeral writing and conversations that left lasting impressions. In talk his contemporaries thought him unrivaled. "He who knows Diderot in his writings only," said Marmontel, "does not know him at all." He worked and talked with disinterested enthusiasm, greeting the mention of a collected edition of his writings with laughter, so well did he know the reckless haste of their composition. Yet they have been well edited by Assezat and Tourneut (20 vols., 1875-77). Diderot's *Correspondence* with Mlle. Volland gives the best clue to his antithetical character. The best study, in English, of his place, environment, and influence is John Morley, *Diderot and the Encyclopædists* (London, 1891). Consult also: Rosenkranz, *Diderot's Leben und Werke* (Leipzig, 1866); Brunetière, *Etudes critiques*, second series (Paris, 1881); Carlyle, *Essay on Diderot* (London, 1881); and the monographs by Damiron (Paris, 1852); Scherer (ib., 1880); Faguet (ib., 1890); Ducros (ib., 1894); Reinach (ib., 1894); Pelissier (ib., 1899).

DIDIER, dē'dyā', Charles (1805-64). A French writer, born in Geneva. After a visit to Italy he published his *Rome souterraine* (1833), a work of fiction which affords a brilliant picture of the revolt against Austria, and other matters of Italian history. He wrote further some verse, and in prose *Campagne romaine* (1842) and *Cinquante jours au désert* (1857).

DIDIER, Jules (1831—). A French landscape and animal painter, born in Paris. He was a pupil of Cogniet and of Laurens, and obtained the Prix de Rome in 1857 and medals at the Salons of 1866 and 1869. His work consists of landscapes, animals, or scenes from peasant life, treated rather sombrely, but with good effect. His "Farm on the Ruins of Ostia" (1866) is in the Luxembourg. He is also known as a lithographer.

DIDION, dē'dyôɴ' Isidore (1798-1878). A French soldier and author, born at Thionville. He was educated at the Ecole Polytechnique and the Academy of Metz; in 1848 was appointed director of the percussion-cap manufactory of the French Army in Paris. In 1858 he became a general of brigade. He wrote valuable works on the science of projectiles, including *Traité de balistique* (1848; 2d ed. 1860); and *Cours élémentaire de balistique* (1854; 3d ed. 1859).

DID'IUS SAL'VIUS JU'LIA'NUS, Marcus. A Roman Emperor for a brief period, March to June, 193. He had commanded the army in Germany and held high military and civil posts in Italy and the provinces, and been named consul more than once. On the murder of Pertinax in 193, the prætorian soldiers offered to support as Emperor whoever would give them the largest price. Didius gave them 25,000 sesterces each and gained the throne, but was soon deposed by the Senate on the approach of Septimius Severus, and murdered by a soldier.

DI'DO (Lat., from Gk. Διδώ), or Elissa. According to the legend, the founder of Carthage. She was the daughter of a king of Tyre, called by some Agenor or Belus, by others Mutgo or Matgenus. His successor, Pygmalion, the brother of Dido, murdered her husband (who was her uncle), a priest of Hercules named Acerbas, called by Vergil, Sichæus. With the treasures of Sichæus, which Pygmalion had sought for in vain, and accompanied by many Tyrians, Dido escaped to sea. She landed in Africa, not far from the Phœnician colony of Utica, and built a citadel called Byrsa (a Phœnician word, confused with Gk. *βύρσα*, the hide of a bull), on a piece of ground which she had bought from the Numidian King, Hiarbas. The meaning of the word Byrsa gave rise to the legend that Dido purchased as much land as could be encompassed with a bullock's hide. After the agreement she cut the hide into small thongs, and thus inclosed a large piece of territory. Here she built the city of Carthage. To avoid being compelled to marry Hiarbas, she stabbed herself on a funeral pile, which she had caused to be erected, and after her death was honored as a deity by her subjects. Vergil ascribes the death of Dido to her unrequited passion for Æneas; but many of the ancient writers conceived that the poet had committed an anachronism in making her contemporary with the Trojan prince. The more general opinion was that Dido had built Carthage somewhere between fifty and one hundred years before the foundation of Rome.

DIDON, dē'dôɴ', Jean Henri (1840-1900). A French Dominican who in the latter half of his life stood in the front rank of French pulpit orators. He was born at Touvet, entered the Order of Saint Dominic in 1862, and during several years preached a famous series of Lenten conferences at Notre Dame in Paris. He died at Toulouse, March 13, 1900. Of his publications there have been translated into English: *Science Without God* (1882); *The Germans* (1884); *Jesus Christ* (2 vols., 1891-92); *Belief in the Divinity of Jesus Christ* (1894).

DIDOT, dē'dō'. The name of a family of French printers and publishers founded by François Didot (1689-1757). Of his eleven children, François Ambroise (1730-1804) and Pierre François (1732-95) were distinguished printers, and the latter's eldest son, Henri (1765-1852), was a noted type-caster, engraver, and mechanician. A descendant of Pierre married Bernardin de Saint-Pierre, who wrote *Paul et Virginie* at a country house near the Didot paper manufactory at Essonne. Pierre Didot (1760-1853), the eldest son of François Ambroise, produced then unexcelled editions of French and Latin classics; his brother, Firmin (1764-1836), was greatest of them all as printer, engraver, and type-founder. He invented the word 'stereotype,' and used the process largely, revolutionizing the book trade by his cheap editions. His manufactory was a place of pilgrimage for the printers of the world. He was also a respectable dramatic author and translator of the classics, and achieved reputation as a moderately liberal politician and deputy. His sons and grandsons have continued the business with honor, but with no increase of fame.

DIDRON, dē'drôɴ', Adolphe Napoléon (1806-67). A French archæologist. Acting on the advice of Victor Hugo, he turned his attention to Christian archæology, examined nearly all the old church edifices of France, and extended his knowledge by travels in Greece, Germany, England, and Italy. In 1844 he established the *Annales Archéologiques*, which became the main source of information in France on mediæval art and antiquities, and was edited by him until his death. He founded a special publishing house for archæological works, in 1845, and established a manufactory of stained glass in 1849, and one for bronzes and goldsmith's ware in mediæval style in 1858. Among his works are: *Histoire de Dieu: iconographie des personnes divines* (1843); *Manuel d'iconographie chrétienne*, *grecque et latine* (1845); and *Manuel des objets de bronze et d'orfévrerie du moyen âge* (1895).

DIDUN'CULUS (Neo-Lat., diminutive of *didus,* from Port. *doudo,* dodo, foolish). A genus of a family (Didunculidæ) of pigeons, peculiar to Samoa, and characterized by a hooked upper mandible and a toothed lower one—the tooth-billed pigeons. See PIGEON.

DIDYM'IUM (Neo-Lat., from Gk. δίδυμος, *didymos,* twin, from δι-, *di-,* double + δύο, *dyo,* two; so called from being found in the same mineral which yields lanthanum). A metal discovered in 1842 by Mosander, in the mineral cerite. It is also found in gadolinite, orthite, and other cerium minerals. Recent investigations have shown that didymium consists of two elements, *neodymium* (symbol Nd, atomic weight 143.6), and *praseodymium* (symbol Pr, atomic weight 140.5).

DID'YMUS (Lat., from Gk. δίδυμος, twin). The Greek translation of the Hebrew name of Thomas, one of the twelve disciples of Jesus, the Greek form of the name Θωμᾶς, *Thōmas,* from which the English name is transliterated, being itself a transliteration of the Hebrew word *Thōmâ,* the meaning of which is 'a twin' (Gen. xxv. 24; xxxviii. 27; Song of Solomon iv. 5, vii. 3). This translation of the name is found only in the Fourth Gospel (xi. 16, xx. 24, xxi. 2—'Thomas, called Didymus'), where it was most appropriately used, in view of the Greek-speaking Christians of Asia Minor, for whom the Gospel was written. See THOMAS, APOSTLE.

DIDYMUS (Lat., from Gk. Δίδυμος) (B.C. 63—?). An Alexandrian grammarian of the time of Augustus. Didymus is famous as author of an enormous number of books, in which he embraced the works of his predecessors, and also as the man who transplanted learning from Alexandria to Rome. The total number of his works is given as 3500 by Athenæus and Suidas; Seneca says 4000. These include commentaries on Homer, Hesiod, Pindar, Bacchylides, Æschylus, Sophocles, Euripides, Eupolis, Cratinus, Aristophanes, Menander, Antiphon, Isæus, Æschines, Demosthenes, Hyperides, and many others. The extant scholia to Homer, Pindar, Sophocles, Euripides, and Aristophanes, in great measure, go back to his commentaries. He also published lexicographical collections on the poets, historians, and orators; wrote on all kinds of questions concerning literary history and composition; and composed historical and antiquarian treatises. From his endless industry he was nicknamed Chalcenteros (Χαλκέντερος), 'Bronzegut,' and, likewise 'The forgetter of books,' βιβλιολάθας, since he forgot some of his own productions. Among the Romans he was in such high repute that Macrobius called him the most learned grammarian of his own or other times. Consult: Schmidt, *Didymi Chalcerteri fragmenta* (Leipzig, 1854); Ludwich, *Aristarchs Homerische Textkritik nach den Fragmenten des Didymus* (Leipzig, 1884-85); Wilamowitz, *Herakles,* vol. i. (Berlin, 1889); Susemihl, *Geschichte der griechischen Litteratur in der Alexandriner Zeit,* vol. ii. (Leipzig, 1892).

DIDYMUS OF AL'EXAN'DRIA (309-394). An ecclesiastical writer. Although he became blind at the age of four, before he had learned to read, he succeeded in mastering all the sciences then known, and, on his ordination, was placed by Athanasius at the head of the Alexandrian school of theology. Most of his works are lost, but we possess a translation by Jerome (one of his pupils) of his treatise on the Holy Ghost, and a translation by Epiphanius of his comments on the canonical Epistles. A treatise against the Manichæans in Greek is also extant. He was condemned by the sixth (680) and seventh (787) ecumenical councils as an Origenist. His works are in Migne, *Patrologia Græca,* xxxix.

DIEBITSCH, dē'bĭch, HANS KARL FRIEDRICH ANTON, Count (1785-1831). A Russian field-marshal. He was born at Grossleippe, Silesia, and at an early age entered the Russian Army. After serving with distinction at Austerlitz, Eylau, and Friedland, and attaining the grade of captain, he devoted a number of years to the study of military science. In 1812 he distinguished himself greatly by recapturing Polotsk, and covering the retreat of Wittgenstein's corps. He was then raised to the rank of major-general, and shortly afterwards, in 1813, was sent into Silesia. After the battle of Leipzig he was made lieutenant-general. In 1814 he urged the march of the Allies on Paris, for which the Emperor conferred on him the Order of Saint Alexander Nevski. In 1815 he attended the Congress of Vienna, and was made adjutant-general to the Emperor. He was present at Alexander's death at Taganrog. The Emperor Nicholas made him baron and afterwards count. In the Turkish war of 1828-29 he had the chief command, took Varna, crossed the Balkans, and made peace at Adrianople. The crossing of the Balkan Mountains was commemorated in the addition of Zabalkanski, 'Crosser of the Balkans' (Russ. *za,* beyond + *Balkany,* the Balkans), to his name, and his elevation to the rank of field-marshal. On the outbreak of the Polish Revolution in 1830 he was given the chief command, but did not meet with his usual success. He died near Polotsk, June 10, 1831, of cholera. Consult: Belmont, *Graf Diebitsch* (Dresden, 1830); Chesney, *Russo-Turkish Campaigns of 1828-29* (New York, 1856).

DIEDENHOFEN, dē'den-hō'fen (Fr. *Thionville*). A town and fortress of Alsace-Lorraine, in the District of Lorraine, Germany, on the Moselle, 15 miles north of Metz (Map: Germany, B 4). Its fortifications are somewhat antiquated, and of little value on account of the eminences commanding them. Its manufactures are unimportant, but there is a considerable trade in fruit, vegetables, grain, wine, and wood. Population, in 1890, 8923; in 1900, 10,060; in 1905, 11,930. Diedenhofen, under the name of Theodonisvilla, was known as early as the Eighth Century, and was frequently the residence of the Carolingian rulers. It came into the possession of France in 1683, and of Germany in 1871.

DIEFENBACH, dē'fen-bäG, LORENZ (1806-83). A German philologist. He was born at Ostheim, Grand Duchy of Hesse, studied theology and philosophy at Giessen, traveled much, and for twelve years was pastor and librarian at Solms-Laubach. He was one of the founders of the German-Catholic party, and in 1848 was a Deputy from Offenbach to the Parliament of Frankfort-on-the-Main. He remained in that city, and in 1865 was appointed second municipal librarian. His literary industry was enormous, and his writings include poetry and romance, as well as learned philosophical treatises. His principal works are: *Celtica* (3 vols., 1839-40); *Vergleichendes Wörterbuch der gotischen Sprache* (2 vols., 1846-51); *Glossarium Latino-Germanicum Mediæ et Infimæ Ætatis*, a supplement to Ducange's well-known Glossary (1857); *Origines Europææ* (1861); *Hoch- und niederdeutsches Wörterbuch* (with E. Wülcker, 2 vols., 1874-85).

DIEFFENBACH, Georg Christian (1822-1901). A German theologian and poet, born at Schlitz, Hesse. He studied at Giessen, and in 1871 became chief pastor in Schlitz. His liturgical, poetical, devotional, and homiletic publications are numerous and highly popular, more especially his poems for children.

DIEFFENBACH, Johann Friedrich (1795-1847). A German surgeon, born in Königsberg, Prussia. After studying at Bonn and elsewhere, and traveling in France, he took his degree in 1822, and commenced practice in Berlin, where he soon attained distinction as an operator, and in 1840 was promoted to be professor and director of clinical surgery. Besides possessing skill in all the usual operations with the knife, Dieffenbach introduced many improvements, particularly in the art of forming new noses, lips, eyelids, and in other plastic operations. He was the author of *Die Transfusion des Blutes und die Einspritzung der Arzneien in die Adern* (1828); *Chirurgische Erfahrungen* (4 vols., 1829-35); *Ueber die Durchschneidung der Sehnen und Muskeln* (1841); *Die Heilung des Stotterns* (1841); *Ueber das Schielen* (1842); and *Die operative Chirurgie* (12 vols., 1844-48).

DIEGO, dê-ā'gô (Sp., James). Sexton to the Spanish Curate in Fletcher's play of that name. It is his constant complaint that 'there's nothing to be got by burials' in his master's parish.

DIEGO, Don. An alias assumed by Surly in Jonson's *The Alchemist;* also by James Formal in Wycherley's *The Gentleman Dancing Master.*

DI'ELEC'TRIC and DIELECTRIC CONSTANT. See Electricity.

DIELMAN, dēl'män, Frederick (1847—). An American painter, born in Hanover, Germany. He was brought to the United States in infancy, passed his youth in Western Maryland, and was educated at Calvert College. From 1866 to 1872 he was a topographer and draughtsman in the United States Engineering Department. He then studied art as a pupil of Wilhelm Diez at the Royal Academy of Munich, and established a studio in New York in 1876. In 1899 he became president of the National Academy of Design, and he was largely instrumental in consummating its union with Columbia College in 1905. In addition to his illustrations, particularly for fine collective editions of standard authors, his work includes genre and historical pictures and portraits, and designs for the mosaic panel "Thrift," in the Albany Savings Bank, and those of "History" and "Law" in the Congressional Library, Washington. At the St. Louis Exposition he exhibited a series of designs for mural paintings and two aquarelles.

DIELS, dēls, Hermann (1848—). A German classical scholar, appointed professor ordinarius of classical philology at the University of Berlin in 1886. He was born at Biebrich on the Rhine, and was educated at the universities of Bonn and Berlin. In addition to his most notable work, *Doxographi Græci* (1879), in which the sources of the doctrines of Greek philosophers as transmitted by post-Aristotelian scholars were for the first time decided upon, his works include an edition of Simplicius's *Commentary on the Physics of Aristotle* (*Simplicii in Aristotelis Physica Commentaria*, 1882); *Die Fragmente der Vorsokratiker Griechisch und Deutsch* (1903); and a treatise on the *Sibyllinische Blätter* (1890). He was one of the editors of the *Archiv für Geschichte der Philosophie* (Berlin), begun in 1887, and of the *Commentaria in Aristotelem Græca.*

DIËL'YTRA. See Dicentra.

DIEPENBEECK, dē'pen-bāk, Abraham van (1596-1675). A Flemish painter and engraver, born in Bois-le-Duc in 1596. He studied under his father, a glass-painter, and executed a number of important glass windows, some of which survive in the Cathedral of Antwerp, the Church of the Dominicans, and elsewhere. Afterwards he studied under Rubens, assisting that artist in his pictures. In 1641 he was elected president of the Antwerp Academy, and held that office until his death. A characteristic specimen of his religious painting is the "Ecstasy of Saint Bonaventura," in the Museum of Antwerp. Among his chief works are "The Atonement," in the Museum of Brunswick; the "Marriage of Saint Catherine," in the Berlin Museum; and the "Lovers with Cupid," in the Louvre. His "Clœlia Fleeing from Porsenna," a historical work, exists in three versions in Berlin, Dresden, and Paris. His masterpiece in designing was a series of engravings for the Abbé de Marolle's "Tableaux du Temple des Muses," published in Paris, 1665.

DIEPPE, dyĕp (connected with AS. *dype*, Dutch *diep*, depth). A seaport in the Department of Seine-Inférieure, France, at the mouth of the river Arques, on the English Channel, 33 miles north of Rouen (Map: France, G 2). Dieppe is situated between two high ranges of chalk cliffs, has tolerably wide, clean streets, running parallel to the sea; and the houses—built for the most part of stone and brick, with high, slanting roofs—have a picturesque appearance. Its fifteenth-century castle, now used as a barracks, occupies a high cliff at the west end of the town, which it commands, as well as the harbor, which is situated to the northeast and admits vessels of 500 tons burden. East of the town and connected by a drawbridge lies the little fishing suburb of Pollet, uninviting in appearance, but interesting from the fact that the inhabitants differ in language, manners, and customs from the rest of Upper Normandy, and are supposed to be descendants of Saxons who settled on the French coast during the Merovingian period. Among the principal buildings are the churches of Saint Jacques and Saint Remy, a museum and picture gallery, and the theatre. The town has several squares, and is adorned by nearly seventy fountains, which derive their supply of water from an aqueduct about three miles long. Dieppe, being one of the principal watering-places of France, has a great accession of visitors during the summer months. The manufactures are lace, fine linen, tobacco, paper, and carved articles of horn, bone, and ivory. There are also ship-building yards, sugar-refineries, rope-walks, and distilleries. The fishing fleet of Dieppe is large and important. Dieppe is a favorite landing-place of English tourists visiting France. Population, in 1891, 22,359; in 1901, 22,839. In 1442 Dieppe held out successfully against a besieging force of English under Talbot. The merchants of Dieppe were early noted for their enterprise, and ships from this port visited Brazil and the East Indies in the Sixteenth Century. The prosperity of the town was destroyed by the expulsion of the Huguenots, who formed a large proportion of the inhabitants. In 1694 it was bombarded by the English and Dutch fleet, and utterly demolished. Though speedily rebuilt, it could not meet the competition of Havre.

DIERVILLA, dĭ'ẽr-vĭl'lȧ. See Weigela.

DIERX, dē'ĕ'rx, Leon (1838—). A French poet born on the island of Réunion and educated at Paris. He became a member of the Parnassians. He published *Aspirations* (1858); *Poèms et poésies* (1864); *Les Lèvres closes* (1867); *Les paroles du vaincu* (1871); *La rencontre* (1875); *Les Amants* (1879). His collected poems (1889-90) were crowned by the Academy.

DIES AND DIE-SINKING (OF. *de*, *det*, Fr. *dé*, Sp., Port., It., *dado*, die, from Lat. *datus*, p.p. of *dare*, to give). The art of making and using dies for stamping coins is of very ancient origin. Old coins have been found which show that it was known to the Greeks at least B.C. 800. The use of dies for stamping, shaping, and cutting out metals and other materials is of much more recent origin, and reached its present development only in the closing years of the last century. The use of the punch and press for cutting metal forms is said to have been practiced in a crude way by a German blacksmith of the fifteenth century. Presses for shaping as well as cutting metal were invented by T. Griffiths, of England, in 1841, but they were developed in France, where they were applied to the production of kitchen utensils. Recently presses have been utilized in many other branches of manufacture besides those dealing with metals. The use of dies, for instance, plays an important part in the modern shoe factory, and, in fact, in all industries where a given form has to be produced repeatedly, whether the material be metal, leather, cloth, or paper. The most recent development in the art of using dies has been in the direction of working cold steel into numerous complicated forms, which were formerly produced only by casting and forging.

The astonishing cheapness of numerous sheet-metal products is mainly due to the use of dies, which accomplish, by a single stroke, the work which formerly required long and tedious manipulation. A striking example is the modern bicycle, a large proportion of whose hundred parts are formed by the power press. Not only kitchen utensils, but jewelry, boxes, pens, buttons, and the thousand and one familiar objects which were formerly worked into shape with the hammer, or soldered together out of separate pieces, are now struck between two dies of suitable form.

Dies, in general, are in pairs, consisting of a male die or punch, and a female die, which are so adjusted on a power press that one fits accurately into the other. Often, however, in cutting the less resistant materials, as leather, cloth, or paper, the two parts of the typical die are not required. The punch is simply forced by a power hammer through the materials, against a flat surface. In an article in the *Engineering Magazine* (New York) for March, 1898, on "The Development of Machinery for Sheet-Metal Stamping," Oberlin Smith divides the kinds of work done by stamping into four general classes: "(1) Cutting, in which are included punching and shearing; (2) forming, including bending, embossing, and curling; (3) drawing and redrawing, which are more than forming, since the metal is subjected to an extensive distortion or molecular flow, incident to the changing of a flat, annular disk into a cylindrical, or conical, or hemispherical form of smaller average diameter, its surface being meanwhile rigidly confined to prevent wrinklings; (4) coining, with which should be included drop-forging, the metal in both cases being treated as a liquid and simply pumped, as it were, into the shape desired, the molecular flow being very great, and the whole object being treated as is a pat of butter or a cake of soap in the molds provided for its new incarnation."

The simplest forms of cutting dies are the *blanking dies*, used for cutting out flat blanks from steel, iron, or other material. A sheer edge is given either to the punch or to the die, according to the work to be performed. When, as in cutting buttons, it is the blanks that are to be used, the sheer edge is given to the die; but when the hole is the object sought, as in making rivet-holes in boiler-plates, the sheer is given to the punch. *Compound cutting dies* are used for cutting fine work, where the relation of the centre or other holes to the outside must be perfect, as in blanks for watch and clock movements, and sheet-iron disks for the armatures of dynamos and electric motors. A compound die has for its upper half a punch set into a die, and for its lower half a die set into a punch; one stroke of the press thus performs the work that would require two or more operations if done on plain dies. *Needle dies* are used for punching eyes in needles. The die is made in three pieces, securely fastened together. The centre piece projects above the surface of the two side pieces, and into the groove of the needle. Thus the needle is supported while being punched. This centre piece has a U-shaped slot, equal in width to the length of the eye of the needle. The press is so arranged that the needle is first stamped and then punched, the speed of the punch at the moment it enters the eye of the needle being very slow.

Bending dies are simple when the metal is bent at a single angle, and complex when a loop is required, as in making armature connections, safety-pins, and the like. *Drawing dies* are dies which are used for 'drawing up' or shaping metal into such forms as basins, thimbles, and bells. In some complex dies the metal is shaped, stamped with a design, and cut, all by a single stroke of the press, as in making blacking-box covers. Very often, however, in producing the more complicated forms of drawn work, the object is put through several dies before it attains its completed shape. The crank-hanger of an ordinary bicycle has to pass through a dozen or more presses before the flat sheet of steel is transformed into the piece of complicated tubing required. But even then the process of cutting and bending cold steel by means of power-driven dies is much less expensive than the old method of forging such parts roughly into shape, drilling out the cavities, and turning and polishing the surfaces.

Considering now the use of dies for stamping figures on metallic surfaces, as coins and medals, it is found that the preliminary process of die-sinking is an elaborate one. It requires great skill and gives opportunity for the display of artistic feeling and talent as well. Die-sinking is a branch of engraving, but it involves the use of other tools besides those of the engraver. A piece of softened steel, called the hub, is prepared, and on its end the design is cut. The steel is then hardened and forms the *matrix*. The design on the matrix is impressed upon another plug of softened steel, with the result that the design, wrought in intaglio on the matrix, comes out in relief on the second piece of metal, which is called the *punch*. The punch, in turn, is hardened and used to impress the design upon a third piece of metal. This third piece is of course an exact duplicate of the matrix and forms the die to be used for stamping coins. The original matrix upon which the design was engraved is not used for stamping coins, because the expense of engraving is very great, and the life of a die is short, but is saved for making more dies. One step in the process outlined may be saved by engraving the design, in relief, in the first place so that the punch made from this design in intaglio can be used as a die for coining or stamping.

Consult: Lucas, *Dies and Die Making* (Providence, R. I., 1897), a practical treatise on making dies; and Woodworth, *Dies, Their Construction and Use* (New York, 1904). The article by Oberlin Smith (see above) contains an admirable résumé of the results obtained by this method of metal-working. See also article MINT.

DIES IRÆ, dī′ēz ī′rē (Lat., day of wrath). The name generally given (from the opening words). to one of the most famous mediæval hymns. It is written in triplets of rhyming trochaic tetrameters; it describes the last judgment in language of magnificent grandeur, and then passes into a plaintive plea for the souls of the departed. Daniel, who calls it 'the chief glory of sacred poetry,' and other eminent authorities agree in assigning its authorship to the Franciscan Thomas of Celano (died c.1255). It found its way gradually into various diocesan missals, and was prescribed for universal use in the revised edition of the Roman missal put forth by Pius V. in 1570. It is one of only five sequences which have been retained in modern usage, and is sung on All Souls' Day and at other masses for the dead. It was translated into English by Crashaw in the seventeenth century, and by Macaulay, Isaac Williams, Dean Stanley, and others in the nineteenth. Perhaps the best version, as well as the most familiar, is that by W. J. Irons. Scott introduced the opening stanzas into his "Lay of the Last Minstrel," and an effective use, heightened by Gounod in his opera, is made of it by Goethe in *Faust*.

DIESKAU, dē′skou, KARL WILHELM (1701-77). A German soldier, born at Dieskau. He fought in twelve campaigns, and rose to be a lieutenant-general. He brought about many important improvements in the artillery service, and under commission of Frederick the Great invented a kind of light cannon known by his name.

DIESKAU, LUDWIG AUGUST, Baron (1701-67). A German officer in the French service, distinguished in the French and Indian War in America. He was born in Saxony, was an adjutant to Marshal Saxe, served under that officer in the Netherlands, and in 1748 was raised to the rank of brigadier-general. In 1755 he was sent to America as major-general, to command the French troops in the French and Indian War, and in August took the field at the head of 3573 men. Early in September he started for Fort Edward at the head of 216 regulars, 684 Canadians, and about 600 Indians; but afterwards changed his plans and moved against Fort George. On September 8, three miles from Fort George, he ambushed and completely defeated a detachment of 1000 men sent against him; but, deserted by the Indians and many of the Canadians, he was himself totally defeated before the fort by a force of English colonists under Sir William Johnson. He was severely wounded, was taken prisoner, and was held until 1763. For an account of his military career in America, consult Parkman, *Montcalm and Wolfe* (2 vols., Boston, 1884).

DIES NON, dī′ēz nŏn (Lat., abbreviated from the phrase *dies non juridicus*, not a court day). A non-juridical day; that is, a day on which the business of the courts in the administration of justice cannot lawfully be carried on. At the common law Sundays and certain other peculiarly sacred days were of this character, as Ascension Day, All Saints' Day, Christmas Day, etc. In the United States certain secular holidays are included in the description of non-juridical days, as well as Sunday, but not all legal holidays, nor all days on which the courts do not sit. A day may be juridical, that is, open to legal process and the administration of justice, even though it be a legal holiday in the usual acceptation of that term, and the courts be not regularly in session. Christmas Day is universally a *dies non*, and in some jurisdictions Thanksgiving, or Fast Day, and Independence Day. But the day of the general election, the Saturday half-holiday, and 'bank holidays' generally are law days. Nor does the fact that certain legal acts, as the giving of a promissory note or its presentment for payment, are prohibited on a certain day affect its juridical character. It is only the virtual suspension of the operations of justice which gives a day the character of a *dies non*, and the policy of the law does not favor the multiplication of such days.

But this paralysis of judicial administration has never been complete. There have always been exceptions to the rule, even in the law courts, and in the early history of equity jurisdiction the Chancellor was restrained only by his own sense of what the sanctities of a holy day seemed to require. To-day the equitable as well as the common-law jurisdiction of the courts is suspended on non-juridical days, and ordinarily there can be no valid issue or service of process of any kind on such days; but it is everywhere held that the court may sit for the purpose of receiving the verdict of a jury, and that warrants for treason, felony, and breach of the peace may issue and be executed on any day; and in general, when public policy or the prevention of irremediable wrong requires it, the courts may sit on Sunday or any other non-juridical day and issue process.

While the doctrine under consideration is of common-law origin, it is now mainly regulated by statute, and the laws defining it usually declare in express terms what juridical acts can and what cannot be lawfully performed on a *dies non*. As to the distinction between judicial and ministerial acts performed on such a day, see 9 Coke's *Reports*, 66, and 5 *Central Law Journal*, 26. On the general subject, see 7 *Southern Law Review*, N. S., 697. See also DAY; HOLIDAY; SUNDAY.

DIESTERWEG, dē̆′stĕr-vȧk, FRIEDRICH ADOLF WILHELM (1790-1866). A noted German educator. He was born at Siegen, Prussia, and in 1808-11 studied at Herborn and Tübingen. He taught at Mannheim and at Worms until 1813, was called to the Model School at Frankfort, was rector of the Latin school, Elberfeld, and in 1820 became director of the new Teachers' Seminary at Mörs, where he laid the foundation of his great reputation as a teacher and educational writer. This led to his appointment, in 1832, as director of the Seminary for City Schools in Berlin, from which post he retired in 1847, after having for years been involved in serious disagreements with the authorities regarding his reformatory views in connection with the most important phases of higher education. He was pensioned by the Government in 1850, and thenceforth propagated his ideas only by his literary efforts. He was elected to the Prussian Diet in 1858. Diesterweg stands in the foremost rank among modern educators, and has rendered the greatest service to education by his training of teachers. As a follower of Pestalozzi, he aimed at making every subject of instruction a means of education, and by his own example, as well as through his writings, has exercised a far-reaching influence on the development of his method in the various branches of instruction. He advocated his pedagogical views in the *Rheinische Blätter für Erziehung und Unterricht,* founded by him in 1827, and afterwards also in the *Pädagogisches Jahrbuch,* which he established in Berlin in 1851. Among his numerous writings, some of the most noteworthy are: *Das pädagogische Deutschland* (1836); *Streitfragen auf dem Gebiete der Pädagogik* (1837); *Leitfaden für den Unterricht in der Formlehre* (1845); *Lehrbuch der mathematischen Geographie*, etc. (18th ed. 1891); *Methodisches Handbuch für den Gesamtunterricht im Rechnen;* and several other standard text-books.

DIET (OF. *diete*, Fr. *diète*, It., Port., Sp. *dieta*, from Lat. *diæta*, Gk. *δίαιτα*, *diaita*, daily regimen). The food substances habitually taken into the body, so as to repair the waste of tissue and provide for growth and development. The diet of different human races is quite different in character. The Eskimos, the Kirghiz, and certain other tribes live exclusively on meat. On the contrary, the Hindus and others subsist almost exclusively upon vegetables. But the most intellectual and successful of the human races have lived on a mixed diet. In health, the diet should be composed of both easily digested food and food difficult of digestion, to be varied according to the amount of exercise taken, the climate, and the occupation.

DIET IN HEALTH. The standard of Voit, of Munich, has long been accepted as the daily diet most suitable to a healthy man of average requirements, doing an average amount of work: 118 grammes of proteids, 56 grammes of fat, and 500 grammes of carbohydrate, to which must be added 30 grammes of salt and 3 liters of water. Chittenden has demonstrated, however, that from 5 to 9 grammes of proteids a day preserves the nitrogen equilibrium for college professors, members of the U. S. Army Hospital Corps, and for trained athletes actually competing in contests.

In estimating the available quantities of these nutrients in a given article of food, it is of course necessary to take into account the factor of digestibility. See FOOD.

DIET IN INSTITUTIONS FOR THE INSANE. Dr. Austin Flint, of New York, prepared for use in the State hospitals for the insane a diet list which has met the requirements of such institutions for many years, with some modifications according to special indications at certain seasons or in certain localities, and supplemented with special diet in cases of special need, as determined by the physicians in charge. According to this, the following is the daily allowance for each individual:

Meat with bone, including salted meats, fresh and salted fish, and poultry	12 oz.
Flour, to be used in making bread and in cooking (may in part be substituted by cornmeal and macaroni)	16 oz.
Potatoes	8 oz.
Milk	8 oz.
Two eggs	4 oz.
Sugar	2 oz.
Butter	2 oz.
Cheese	2 oz.
Rice, hominy, or oatmeal	1½ oz.
Beans or peas (dried)	1½ oz.
Coffee (green)	1 oz.
Tea (black)	⅛ oz.

DIET IN DISEASE. In disease the activity of digestion is generally lessened, and there is a total waste or loss from the body of certain tissue constituents which in health are replaced as rapidly as they are excreted. In chronic disease the preservation of nutrition is of great importance from the start, and the highly nutritious foods are of the most value, varied from time to time as strength and appetite demand. In acute disease, with prostration, withdrawal of nitrogenous food is generally necessary, together with a diminution of starches and sugars, and an increase of fats. In acute processes, accompanied by inflammation, as well as in fevers, serious changes occur in the constitution of the solids and fluids of the body. Interstitial fat disappears; muscles become pale and relaxed, and their contractibility is partially lost; digestion becomes impaired and remains either feeble, abnormal, or suspended; food is imperfectly prepared for assimilation and enters the blood in improper condition; the blood suffers alteration; the urine is found to contain an increase of urates and often also uric acid; the excretion of phosphates is increased, and that of chlorides is diminished; while in the tissues imperfect metamorphosis occurs, pathological materials being stored in them, together with waste products awaiting elimination, and a granular disintegration, or parenchymatous degeneration, may follow. The importance of a properly modified diet is obvious. In such cases milk forms the best diet, to the exclusion of all other food, and about six ounces of milk should be given to the patient every two or three hours, unless vomiting be present. Broths and soups possess very small value as food, but may be given in addition to the proper amount of milk for the sake of variety, and to avoid the occurrence of a disgust for milk. With the fall of temperature, the simpler solids are administered by degrees, beginning with soft-cooked eggs, green vegetables, oysters, etc. Beef tea is of very slight value, and in no case should reliance be placed upon it as nourishment. When patients cannot take milk, peptonized combinations of beef, milk, and gluten may be substituted for it.

In disease of the digestive organs skim-milk is of the highest value. If acute and confined to the stomach, such disease is best combated if easily digested aliments are administered, as milk and lime-water, whey, barley-water, etc. In chronic affections of the stomach, with feeble digestion owing to deficiency of the gastric juice, the following articles of food will be found desirable: boiled rice, tapioca, arrowroot, biscuits (crackers), and farinaceous vegetables. Where fermentation of starchy and fatty foods occurs, these must be omitted from the diet, and in their stead acid fruits and vegetables, such as apples, peaches, tomatoes, tamarinds, oranges, etc., should be eaten. In intestinal indigestion and summer diarrhœa, starches and fats should be omitted from the dietary, and milk, eggs, animal broths, broiled beefsteak, oysters, and fresh fish are suitable. Habitual constipation due to torpor of the muscular layer of the intestine may be relieved by a diet of cereals, whole-wheat bread, fruits, and green vegetables, with liberal quantities of water.

In many diseases particular diets are requisite. In *diabetes*, for example, all sugar and sugar-producing food must be withheld, while animal food and fats must be administered in abundance. Water must be drunk freely. Saccharin must be substituted for sugar. The patient may therefore take meat soups; fresh fish, lobsters, and crabs; fat meat, poultry, kidneys, sweetbreads, ham, tongue, sausage, and all kinds of game; pickles, sardines, olives, celery; gluten bread, gluten rolls, gluten mush, almond bread and cakes, bran cakes; all green vegetables, nuts, acid fruits, cream custards, cheese, jellies, ice-cream (made with saccharin), tea and coffee, buttermilk, koumiss, skim-milk, red wine, in moderation; mineral waters. All flour must be carefully avoided. In *Bright's disease,* the patient must avoid overfeeding, and must take easily assimilated food that leaves a small amount of nitrogenous waste material. He may take soup made of arrowroot, milk, and rice, tapioca, or vermicelli; fresh whitefish, raw oysters and clams; very little red meat; chicken, game, fresh pork, bacon and ham; eggs sparingly; wheat bread, hominy, oatmeal, gruels, toast; green vegetables, well cooked; mushrooms, rhubarb; simple puddings of milk and rice or of bread; stewed fruits, laxative raw fruits, fruit jellies; milk, koumiss, barley-water, buttermilk, and mineral waters; very weak tea. In *tuberculosis* the patient should eat as much as can be digested, mostly of fatty and nitrogenous foods, taking food between meals and at bed-time, and thus receiving some food every three hours during the day. He may take soups; fresh fish and oysters; all meats not smoked or salted, except pork; eggs in all forms except fried; breads with an abundance of butter; all green vegetables, no roots, no potatoes; fats and olive oil; fruits, cheese, farinaceous desserts; milk, cream, cocoa, koumiss, Vichy water, lemonade, mineral waters, and stimulants as ordered by the physician. It is imperative that food prepared for invalids should be well cooked. The taste and appetite are not trustworthy guides in sickness, but odors, flavors, and dainty serving should be considered. Food should be served very hot or very cold; seasoning, except with salt, should in general be avoided; and small quantities should be offered at a time, with scrupulous care that utensils and linen be clean. See the general article FOOD, and the special articles MEAT; FISH; BREAD, etc.; MEAT EXTRACT. Consult Chittenden, *Physiological Economy in Nutrition* (New York, 1905).

DIET (etymology same as preceding). A name at present applied to the legislative bodies in the German States, to the provincial assemblies in Austria, and to the Hungarian Parliament. These assemblies are called in German *Landtag.* The German Imperial Parliament bears the name of *Reichstag,* which word, when applied to the representative assembly of the old German Empire (Holy Roman Empire) figures in English works as Diet. The federal assembly of the Germanic Confederation (*Bundesrat*) is also styled Diet in English. The word Diet is also applied to the representative assemblies in the old kingdom of Poland and other countries. The Diet of the Holy Roman Empire was made up of the Electoral College (q.v.), the princes of the Empire, spiritual and temporal, and the delegates of the free Imperial cities. The princes, save in the matter of electing the Emperor, had the same rights as the Electoral College. The powers of the free Imperial cities were quite limited, and were not even formally recognized until 1648. Each of the three colleges voted separately. When they agreed on a measure it was submitted to the Emperor for ratification or for rejection, but he had no power to modify it. No measure affecting the welfare of the Empire could be passed without the assent of the Diet. The regular meetings were held twice a year, usually in some chief town of the Empire. After the close of the Thirty Years' War the power of the body declined, though it continued to hold its meetings at Ratisbon down to the dissolution of the Holy Roman Empire in 1806. Consult: Bryce, *The Holy Roman Empire* (London, 1871); Waitz, *Deutsche Verfassungsgeschichte* (6 vols., Berlin, 1865-96); Turner, *The Germanic Constitution* (New York, 1888).

DIETERICI, dē'te-rē'tsē, FRIEDRICH (1821-1903). A German Orientalist, born in Berlin. He studied at the universities of Halle and Berlin, traveled extensively in the East, and in 1850 was appointed professor of Semitic literature in the University of Berlin. He won particular distinction by his researches in the Arabic language and literature. The long list of his published works include: *Alfiyyah Carmen Grammaticum Auctore Ibn Malik cum Commentario Ibn Akil* (1851); *Mutanabii Carmina cum Commentario Wahidii* (1858); *Die Philosophie der Araber im neunten und zehnten Jahrhundert nach Christus* (1876); and *Die Abhandlungen der Ichwân Es-Safâ in Auswahl* (1883-86).

DIETERICI, Karl Friedrich Wilhelm (1790-1859). A German political economist. He was an engineer-geographer in Blücher's army from 1813 to 1815, was engaged in the Ministry of Public Instruction, became professor of political science in the University of Berlin, and in 1844 was placed at the head of the statistical bureau. He published a number of important works on political economy and statistics, among which may be mentioned: *De Via et Ratione Œconomiam Politicam Docendi* and *Statistische Uebersicht der wichtigsten Gegenstände des Verkehrs und Verbrauchs im preussischen Staat und im deutschen Zollverband* (1838).

DIETRICH, dē'trĭk, Auguste Edgard (1846—). A French author, born at Nancy. From an early age he took a special interest in the German language and literature, and was the first to translate two of Max Nordau's works into French under the following titles: *Les mensonges conventionnels de notre civilisation* (1886) and *Le mal du siècle* (1890). He contributed to many French and foreign reviews, such as *La Revue du Nord, La Jeune France,* and *Le Messager de Vienne,* and translated Lady Blennerhassett's *Madame de Staël et son temps* (1890). His original publications include *Les maîtresses de Louis XV.* (1881) and *Rouget de Lisle et la Marseillaise* (1882). He also edited the *Poésies de Jacques Richard* (1885).

DIETRICH, dē'trĭk (also **DIETRICI** and **DIETRICY**), Christian Wilhelm Ernst (1712-74). A German artist, born at Weimar. As an artist he was but mediocre. His claim to distinction is that of an administrator. In 1746 he was made inspector of art galleries, in 1763 director of the manufactory of porcelain at Meissen, and in 1765 professor of the Academy of Dresden. In these capacities he did excellent service.

DIETRICH OF BERN. The name under which Theodoric the Great (q.v.) appears in German heroic legends; by Bern, his capital, Verona is to be understood. With a not unusual disregard of all historical truth, Dietrich was brought into connection with the traditions of Attila, or Etzel. According to these legends, Dietrich is said to have fled from Italy before Otacher (Odoacer), or Ermanerich, and to have met with a hospitable reception from Etzel. After many years he regained possession of his kingdom. Dietrich appears in the second part of the *Nibelungenlied,* at Etzel's Court, and is praised with special predilection. There were numerous other poems in which Dietrich was the central figure, but only late versions of these poems have come down to us. Consult Heinzel, *Ueber die ostgotische Heldensage* (Vienna, 1889).

DIETRICHSON, dē'trĭk-sōn, Lorentz Henrik Segelcke (1834—). A Norwegian author, born at Bergen. He became professor extraordinary at the University of Christiania in 1875 and has done much to encourage the arts and industries of Norway and Sweden. Among his numerous works are: *Olof Liljekrans* (1858); *Stories of Travel* (1875-77); *Didactic Poetry in the North* (1860); *The Art of Wood Sculpture in Norway* (1879); *Manners and Customs* (1887); and others on kindred subjects.

DIETRICH VON NIEM, dē'trĭk fōn nēm. See Niem, Dietrich von.

DIETSCH, dĕch, Heinrich Rudolf (1814-75). A German philologist, born at Mylau. In 1847-62 he was one of the editors of the *Neue Jahrbücher für Philologie und Pädagogik.*. He published a valuable edition of the complete works of Sallust (2 vols., 1843-46; 4th ed. 1874) and a *Versuch über Thucydides* (1865).

DIETZ, dēts, Feodor (1813-70). A German historical and battle painter, born at Neunstetten, Baden. He first studied under Rudolf Kuntz in Karlsruhe, then at the Munich Academy (1833-36) under Clemens Zimmermann and under Philip Foltz, whom he aided in the decoration of the new royal palace. His first independent effort, "Death of Max Piccolomini" (1835), now in the Karlsruhe Gallery, attracted great attention. He spent three years in Paris, where he was influenced by Horace Vernet, and studied for a short time under Alaux. In 1839 he was awarded the great gold medal. He was appointed Court painter at Karlsruhe, but returned to Munich, where he produced his best work. He took part as a volunteer in the campaigns of 1848-49 in Schleswig-Holstein, and in 1862 was made professor of the newly created School of Arts at Karlsruhe. He died while serving in the Franco-Prussian War of 1870. His work was often theatrical, but is clear in composition and spirited in treatment. Among his best works are the following: "Nocturnal Review" (1853), received with general favor and acquired by Napoleon III.; "The Destruction of Heidelberg by General Melas" (1856), his masterpiece, in the Gallery at Karlsruhe; "Flight of an American Family Across the Susquehanna," an interesting romantic genre piece, Paris Exposition, 1867; "Blücher's March to Paris" (1868), in the National Gallery in Berlin.

DIEU ET MON DROIT, dyẽ ȧ mōɴ drwä (Fr., God and my right). The battle-cry of Richard I. at the battle of Gisors (1195), signifying that he was not subject to France, but owed his power to God alone. The King was victorious over the French, and the battle-word was adopted as the motto on the coat-of-arms of England. Edward III. revived the motto in 1340.

DIEULAFOY, dyẽ'lȧ'fwä', Georges (1840—). A French physician. He was born in Toulouse, and studied in Paris. In 1886 he was appointed professor of pathology at the university in that city, and in 1896 he became clinical professor at the Hôtel Dieu. In the publication entitled *De l'aspiration pneumatique souscoutanée, méthode de diagnostic et de traitement* (1870) he recommended the method of puncturing the thorax discovered by Van den Corput in 1857, for the treatment of pleurisy. Another important work is the *Manuel de pathologie interne* (2 vols., 1882). His investigations on appendicitis attracted wide attention in medical circles.

DIEULAFOY, Marcel Auguste (1843—). A French engineer and archæologist, born in Toulouse. While in Persia in 1885, he discovered at Susa the remains of the palaces of Darius I. and Artaxerxes. He brought back to France a quantity of very valuable specimens of Persian architecture, which have a special department in the Louvre, and published an interesting account of his discoveries in the work entitled *L'art antique de la Perse* (1884-89, 5 vols. in 4). His wife, Jane Paule Rachel Mayre (1851—), accompanied her husband in these journeys and assisted him materially. Her works include *La Perse, la Chaldée et la Susiane* (1886). She was made a member of the Legion of Honor.

DIEZ, dēts, Friedrich Christian (1794-1876). A German philologist and founder of the scientific study of Romance philology. He was born and educated at Giessen, served in the War of Liberation, and later took a supplementary course in philology at Göttingen. In 1830 he was called to the chair of Romance philology at Bonn. The works respectively entitled *Die Poesie der Troubadours* (1826; 2d ed. 1883) and *Leben und Werke der Troubadours* (2d ed. 1882) soon made him widely known. These and the standard publication entitled *Grammatik der romanischen Sprachen* (5th ed., 1882; Engl. trans. by Cayley, 1863) and *Etymologisches Wörterbuch der romanischen Sprachen* (5th ed. by von Scheler, 1887; Eng. trans. by Donkyn) obtained recognition even among the Romance nations as works of basic importance. They are written in a clear and concise style, and in them the author has given to the world a classic example of the historical and comparative method of investigation.

DIFFERENCE. See Identity.

DIFFERENCE, Method of. See Induction.

DIFFERENCE (OF., Fr. *différence*, Lat. *differentia*, from *differre*, to differ, from *dis-*, apart + *ferre*, to bear). In heraldry, an addition to or alteration in an escutcheon to mark a distinction between the coat-of-arms of two closely related persons whose shields would otherwise be the same. Though generally confounded with marks of cadency (q.v.), differences have, in strict usage, a totally different function—the former being employed to distinguish brothers and their descendants after the death of the father, the latter while he is still alive. Differences in this limited sense may consist either of a chief added to or a bordure placed round the plain shield borne by the head of the house; or should the shield exhibit any of the ordinaries, as the bend, fess, or pale, the difference may be indicated by an alteration in the lines of the ordinary. The proximity of the bearer to the head of the house is indicated by the character of the line by which the differencing chief, or bordure, or ordinary is marked off from the field, the following being the order usually observed: the first or eldest brother on the death of his father inherits the pure arms of the house; the second brother, if the difference is to consist of a bordure, carries it plain; the third, ingrailed; the fourth, invected; the fifth, embattled; etc. Other modes of differencing have been invented by heralds, and are not unknown to practice, such, for example, as changing the tinctures either of the field or of the principal figures, of which Nisbet gives many famous examples; altering the position or number of the figures on the shield; adding different figures from the mother's coat or from lands, and the like. Where the cadet is far removed from the principal family, if the field be of one tincture, it is sometimes divided into two, the charge or charges being counter-changed, so that metal may not lie on metal, nor color on color. The confusion between differences and marks of cadency, above referred to, occurs in the heraldic usage of England, Scotland, and the countries of the Continent. In France the cadets of the House of Bourbon have been in the habit of continuing these marks, and at the present day the label or lambel is to be seen on the arms of all the members of the Orleans family. That no distinction between what we call marks of cadency and differences was there observed is further apparent from the fact that, while such was the practice of the House of Orleans, the House of Anjou carried a bordure gules, and that of Alençon a bordure gules charged with eight bezants. In Germany, according to Sir George MacKenzie, several branches of great families are distinguished only by different crests; and he gives as the reason that all the sons succeed equally to the honors of the family. In Great Britain and in France, some change is always made on the shield as carried by the head of the house; but the practice even of good heralds has been so irregular as to bring the rule very nearly to what MacKenzie holds to be the correct one—that every private person should be allowed, with the sanction of the proper authorities, "to make what marks of distinction can suit best with the coat which his chief bears." See Heraldry.

DIFFERENCE. In mathematics, difference usually means the excess of one quantity over another of the same kind, and this is its meaning in arithmetic. In higher mathematics, however, it is used in connection with series and functions in a special sense. Consider the following systems:

Given series	4, 7, 11, 18, 31, 54, 92, 151, 238, ...
First differences	3, 4, 7, 13, 23, 38, 59, 87, ...
Second "	1, 3, 6, 10, 15, 21, 28, ...
Third "	2, 3, 4, 5, 6, 7, ...
Fourth "	1, 1, 1, 1, 1, ...

The law of formation is not obvious in the first series, but by subtracting its successive terms and forming the first differences, repeating the process and forming the second differences, and repeating it again for the third differences, a series is found whose law of formation is obvious. Beginning with 7, the sixth term of the third differences, the ninth term of the given series is evidently 238. The general formula for the nth term of such a series is

$$t_n = a + (n-1)b + \frac{(n-1)(n-2)}{1\cdot 2}\cdot c + \frac{(n-1)(n-2)(n-3)}{1\cdot 2\cdot 3}\cdot d + \dots,$$

in which a, b, c . . . represent respectively the first term of the several series. The sum of n terms is expressed thus:

$$S_n = na + \frac{n(n-1)}{1\cdot 2}\cdot b + \frac{n(n-1)(n-2)}{1\cdot 2\cdot 3}\cdot c + \dots..$$

Certain calculating machines (q.v.), particularly the difference engine, are constructed on this principle. Out of the method of differences arose the calculus for finite differences. (See Calculus.) Pierre Raymond de Montmort (1678-1719), François Nicole (1683-1758), and Brook Taylor (1685-1731) were pioneers in this subject.

DIFFERENCE, Specific, or **DIFFERENTIA.** See Predicables.

DIFFERENCE OF LATITUDE. See Latitude and Longitude.

DIFFERENCE OF LONGITUDE. See Latitude and Longitude.

DIFFERENTIAL CAL'CULUS. See CALCULUS.

DIFFERENTIAL EQUATION. See EQUATION.

DIFFERENTIATION. See CALCULUS.

DIFFERENTIATION. In biology, the process by which the body becomes more complex by becoming different in its different parts. Both phylogenetically and ontogenetically, organisms begin in a relatively simple state; evolution and individual development are both accompanied by specialization of organs and division of labor among the various parts of the body.

DIFFICULTY, THE HILL. An impediment in Christian's journey to the Celestial City, in Bunyan's *Pilgrim's Progress*.

DIFFRACTION AND DIFFRACTION GRATINGS (from Lat. *diffringere*, to break in pieces, from *dis-*, apart + *frangere*, to break). When shadows are cast on a screen by allowing light from a small opening or source to pass an opaque body, it is noted that the shadows are not sharp, as would be expected if 'light traveled in straight lines.' Thus, if light from the sun or from any source of light falls upon a large opaque screen in which there is a narrow slit; and if there is placed some distance from this another opaque body with a sharp edge (e. g. a knife-blade) parallel to the slit, the shadow of the latter cast by the light from the slit will have several peculiarities. Calling the geometrical shadow the region where there would be darkness if light traveled in straight lines, it will be observed that the actual shadow begins a slight distance within the geometrical one—in other words, the light is bent slightly into the latter; further, on the edge of the geometrical shadow, where one might expect uniform illumination, there are series of narrow colored bands, parallel to the edge, that is, there is first a strip brightly illuminated with one color, then another band with a different color, etc., the colors merging into each other; at a distance of a few millimeters from the edge of the shadow, however, the field is uniformly illuminated. If instead of having white light as the source, a colored flame is used, e. g. light from a flame containing sodium, the bands outside the geometrical shadow become simply alternations of light of the colors of the flame, and darkness. This phenomenon is called 'diffraction,' and was first observed by Grimaldi, professor in the Jesuits' College, Bologna, in 1665. It was studied later by Newton, but was not explained until Fresnel made his classical research in 1819. Similarly, if light from a pin-hole opening falls upon any opaque object, casting a shadow of it on some suitable screen, diffraction bands may be observed outside the geometrical shadow, following the general contour of the latter; and the light enters slightly into the shadow. For other cases of diffraction, reference should be made to some treatise on Light. One of the best is Preston's *Theory of Light* (London, 1895).

It was shown by Fresnel that diffraction phenomena are explained by the fact that light is due to a wave-motion (see LIGHT); consequently, diffraction is possible with other waves, e. g. those in air which produce the sensation of sound.

The colors of the feathers of many birds and of 'mother-of-pearl' are due to diffraction; so are the colors seen when one looks at a bright light through a piece of thin cloth. If a great number of fine scratches, evenly spaced, are made on a piece of glass, or on a polished mirror, there is formed a 'diffracting grating.' The former is called a 'transmission' grating; the latter, a reflecting one. If, as in a previous experiment, white light from a slit in an opaque screen is allowed to fall perpendicularly upon a transmission grating, the slit being parallel to the scratches, the transmitted light will be broken up into spectra, regularly spaced on both sides of the line drawn from the slit to the grating, except in the direction of this line. Thus, if the transmitted light falls upon a white screen parallel to the grating, there will be a central white spot, and on each side of this, along a line at right angles to the lines on the grating, a succession of colored spectral bands. This spreading sidewise of the light is due to its diffraction through the narrow, transparent slits between the scratches; and the dispersion of the white light is occasioned by the fact that the amount of diffraction varies with waves of different wave-number, i. e. with different colors (see LIGHT). The same phenomena are observed with reflection gratings if the screen is placed on the same side as the slit of light and provided with an opening to allow the light to fall upon the grating.

Gratings are of the utmost importance in spectroscopy (q.v.), as they furnish a means of measuring the wave-lengths of ether-waves. They were invented and first used by Joseph von Fraunhofer, of Munich, in 1821. To be of value, gratings must be ruled with the scratches at *exactly* equal intervals. This is secured by placing the surface to be ruled on a platform, which is carried forward by a long screw, whose thread is perfectly uniform, and by having a diamond point so arranged as to draw lines at right angles to the direction of the screw. By means of a toothed wheel fastened to the screw, it is turned through a definite proportion of one complete revolution, thus carrying the platform forward a definite distance; for example, if the threads of the screw are at a distance 1-15th of an inch apart, and if the toothed wheel has 1000 teeth, then if this wheel is pushed round by an amount equal to one tooth, the screw will turn through 1-1000th of a complete revolution, and will carry the platform forward 1-15,000th of an inch. Then the diamond is drawn across the surface of the grating, making a groove; it is raised, pushed back to the other side of the grating, dropped down and again drawn across the surface, the platform in the interval of time, while the diamond is pushed back, having been carried forward another step. The process is continued until as many lines are made as are desired. Such a machine is called a 'dividing' or a 'ruling engine.' (See DIVIDING ENGINE.) The most perfect gratings now in use have been made at the physical laboratory of Johns Hopkins University, where Professor Rowland supervised their preparation. His gratings have, as a rule, 15,000 lines or scratches to the inch; and the grating surfaces vary from two inches to six in width.

To use gratings ruled on plane surfaces for spectroscopic purposes, it is necessary to combine them with telescopes and collimators; but Professor Rowland has shown that reflecting gratings ruled on spherically concave surfaces can be used without the addition of lenses. These 'concave gratings' have other marked advantages over plane ones for almost every spectroscopic purpose. A good description of their properties is given in Preston's *Theory of Light* (London, 1901).

DIFFUSION (Lat. *diffusio*, a spreading out, from *diffundere*, to diffuse, from *dis-*, apart + *fundere*, to pour). The gradual dispersion of the particles of one substance among those of another.

DIFFUSION OF LIQUIDS. If sulphuric acid be carefully poured through a tube into the bottom of a vessel filled with water colored by a few drops of litmus solution, and the liquids allowed to remain undisturbed, the acid will be seen gradually to diffuse upward into the water, its progress being indicated by the change of color of the litmus from blue to red. After a sufficiently long time the liquid will be found perfectly homogeneous; i. e. the two layers of acid and water will have completely intermixed, forming a dilute solution of sulphuric acid of uniform strength throughout. A similar process would take place in the case of water and alcohol, and, in general, in the case of any pair of liquids that are at all capable of being mixed together. In many cases, however, the *rate* of diffusion would be so small that it might take months and even years before the solutions would become perfectly homogeneous. The reason of this is that the surface of separation of two liquids is, under ordinary circumstances, comparatively very small. To render the diffusion more rapid, the surface through which diffusion takes place would have to be increased; and this is usually attained by *stirring* the two liquids with the aid of some solid object, as a glass rod or a spoon. Diffusion itself, however, is a purely molecular process; that is to say, it involves the motion not of *masses* of liquid, but of *molecules*.

DIFFUSION OF GASES. If two flasks be filled, one with hydrogen, the other with chlorine, and connected by a long tube fitted into their necks by means of corks, then, in whatever position the apparatus be placed, it will be found that the gases mutually interpenetrate. The color of chlorine will in this case enable us to follow by the eye the course of the diffusion. When the mixture has attained its permanent state, each of the gases is found to be uniformly diffused through the whole containing space, precisely as it would have been had the other not been present. In fact, the presence of a second gas seems merely to affect the *time* which the first takes to distribute itself evenly throughout the vessel, but in no other way to influence the final result. Dalton long ago suggested the analogy of the passage of water among stones in the bed of a river.

The molecules of gases are capable of passing through solid partitions, which would prevent the motion of masses. The phenomena of diffusion can therefore be readily investigated by measuring the amounts of various gases passing in a given interval of time through a thin layer of bladder or other membrane, or through a thin disk of plaster of Paris, graphite, or biscuit-ware. The velocity of diffusion is thus found to be inversely proportional to the density of the gas experimented upon. That lighter gases diffuse more rapidly than heavier ones may be demonstrated as follows: A glass tube, say one inch in diameter, and two or three feet long, is closed at one end with a diaphragm of plaster of Paris and filled with hydrogen. Its open end is immersed in water, care being taken not to wet the diaphragm. Two processes of diffusion will then take place simultaneously: the hydrogen will diffuse out of the tube into the atmosphere, while the constituent gases of the air will pass through the diaphragm inward. But as hydrogen is much lighter than the gases of the air, the velocity with which it escapes is greater than that with which the others enter, this being shown by a rise of water in the tube, whose part occupied by gas will continue to decrease until all the hydrogen has diffused out. See, also, EFFUSION.

DIFFUSION OF SUBSTANCES IN SOLUTION. According to modern chemical theory, solid substances in solution exhibit the same phenomena as substances in the gaseous state. Within a given volume of solution, a substance exercises, for instance, precisely the same pressure (osmotic pressure) that it would exercise if vaporized and confined within a vessel whose volume is equal to the volume of the solution. This explains the perfect analogy existing between the phenomena of diffusion of gases and the phenomena of diffusion of substances in solution.

Diffusion in solution was discovered in 1815 by Parrot, and was later (about 1850) made the subject of a thorough investigation by Thomas Graham. Shortly afterwards Fick succeeded in proving, both theoretically and experimentally, that the diffusion of dissolved substances follows precisely the same law as the diffusion of heat (Fourier's law). Accordingly, the amount of substance traversing a small distance within the solvent is proportional to the area of the cross-section through which the diffusion takes place, and to the difference in concentration at the two ends of the small distance traversed. The rate of diffusion in a given solvent depends, of course, also upon the nature of the diffusing substances, and upon the temperature; at higher temperatures, the rate of diffusion is considerably greater than at lower ones. In more recent years Nernst deduced these laws from the theory of osmotic pressure. The fact that sugar, for instance, diffuses in solution much less rapidly than a gas whose pressure in different parts of a vessel has become unequal, is explained by the fact that friction in liquids is much greater than friction in gases. The laws of osmotic pressure permit of calculating the exact amount of resistance offered by the friction of the solvent to the diffusion of the dissolved substance, if the rate of diffusion has been determined experimentally. The resistance is found to be enormously great. Thus, in the case of sugar diffusing in aqueous solution, the force required to move 342 grams at the rate of one centimeter a second, at the temperature of 18° Centigrade, is equal to the weight of 4,700,000,000 kilograms.

The components of substances which exist in solutions in a state of chemical dissociation may be separated by diffusion, for each of those compounds has its own characteristic rate of diffusion. In this manner, for instance, at least a partial separation of the sulphates making up ordinary alum may be effected, the rates of diffusion of the sulphates being quite different. This does not apply, however, to electrolytic dissociation. (See Dissociation.) True, the ions of electrolytes possess, of themselves, different capacities for diffusion; thus, in a solution of hydrochloric acid, the electro-positive hydrogen ions could diffuse much more rapidly than the electro-negative chlorine ions. But their separation by diffusion would cause one part of the solution to become charged with positive, the other with negative, electricity. In this manner an electro-static attraction would be established between the two parts of the solution, by the force of which the different ions would again become mixed. In processes of electrolysis, however, the electro-static attraction just mentioned is counteracted, and then the products of electrolytic dissociation of acids, bases, and salts can actually be separated. See Osmosis; Solution; Colloids.

Diffusion of Solids. The diffusion of solid substances through one another is shown by a number of phenomena. Not to speak of the even distribution of hydrogen gas through a mass of platinum or palladium, the surface of which has been exposed to the gas—solid carbon is known to be capable of passing through porcelain and to distribute itself evenly in a mass of iron. Further, solid barium sulphate and solid sodium carbonate have been shown to react with each other chemically—a process which could hardly take place unless the molecules of the two substances became intimately intermixed by diffusion. Finally, experiments have been carried out on the diffusion of gold into lead at ordinary temperatures. At 18° C., gold has been found to diffuse upward, and, after a lapse of four years, traces of gold could be found at a distance of 7 millimeters from the surface of contact.

DIGAM'MA (Lat., Gk. *δίγαμμα*, from *δι-*, *di-*, double + *γάμμα*, *gamma*). The name given by grammarians not earlier than the first century A.D. to Vau, anciently the sixth letter of the Greek alphabet. The name is due to the form, double gamma, ϝ. In the Ionic alphabet it was lost by the seventh century B.C., save as the numeral 6; the Chalcidian alphabet, however, retained it, and transmitted it, through Cumæ, to the Latins, with whom it lost its original sound (approximately our w), and became F. Even where it had ceased to be written, as in the Homeric poems, its influence can be detected, and often the cognate words in other languages than Greek show it, e. g. *vinum* = *ϝοῖνος*, wine.

DIGBY. A port of entry and popular summer resort, capital of Digby County, Nova Scotia, on the Bay of Fundy (Map: Nova Scotia, D 5). It has lumber and ship-building industries, a long pier, good bathing, boating, and fishing facilities, and a special reputation for a variety of small herrings or pilchards, known as 'Digby chickens,' which are cured for export, and have a high flavor. The United States is represented by a consular agent. Population, 1901, 1150; in summer, 1905 (local est.), 2000.

DIGBY, George, second Earl of Bristol (1612-77). An English legislator. He was born in Madrid, was a member of the Long Parliament, and was one of the foremost opponents of Strafford. He was extremely vacillating by nature, and, after figuring as a champion of privilege, espoused the royal cause. In the Civil War he was for a time lieutenant-general of the royal army. During the Commonwealth he lived in France, where he rose to the rank of lieutenant-general, but was subsequently dismissed because of a political intrigue. After his return to England he was the accuser of Lord Clarendon, upon whom he endeavored to fasten a charge of high treason. He wrote the comedy *Elvira: or, The Worst Not Always True.*

DIGBY, Sir Kenelm (1603-65). An English author and naval commander. He was born three years before the execution of his father, Sir Everard Digby, noted as one of the gunpowder plot conspirators. At the age of fifteen he was entered at Gloucester Hall, Oxford. Leaving the university in 1620, without a degree, he traveled abroad. Returning, he was knighted. In 1625 he married the celebrated Venetia Stanley. In 1628 he equipped two ships at his own expense, and sailed on a privateering expedition against the French and Venetians in the Mediterranean. He won a victory in the harbor of Iskanderun. In 1632, on the death of Dr. Allen, of Gloucester Hall, Digby inherited his collection of books and manuscripts, which he presented to the Bodleian Library. In the troubles between King Charles and Parliament, Digby took the Royalist side, and was imprisoned in Winchester House, but in 1643 was allowed to retire to France. After Charles I. had fallen, Digby returned to England, but Parliament forbade him the kingdom, under penalty of death. Retiring to the Continent, he traveled in France and Italy; but in 1655 he was again in England, and was in frequent attendance at the Court of the Protector. He went again to France, and busied himself with the preparation of philosophical papers. He returned to England in 1661, and died there. His works are numerous, and on a great variety of subjects, comprising: *A Conference with a Lady About Choice of Religion* (Paris, 1638); *Observations on Spenser's Faery Queene* (London, 1644); *A Treatise on the Soul, Proving Its Immortality* (Paris, 1644); *Of the Cure of Wounds by the Powder of Sympathy* (London, 1658); and *Discourse on Vegetation* (London, 1661), etc. *The Private Memoirs of Sir K. Digby, etc., Written by Himself*, were published in London in 1827. Consult: "Journal of the Scanderoon Voyage," in *Camden Society Publications* (London, 1868); and *Poems*, ed. Warner (London, 1877).

DIGBY, Kenelm Henry (1800-80). An English writer. He was born in Ireland, graduated at Cambridge in 1819, and soon afterwards became a convert to the Roman Catholic Church. He published many works, chiefly on mediæval theology, or reflecting the spirit of the Middle Ages. The list includes: *Mores Catholici: or, Ages of Faith* (11 vols., 1831-40); *Compitum: or, The Meeting of the Ways at the Catholic Church* (7 vols., 1848-54); *The Broad Stone of Honor: or, Rules for the Gentlemen of England* (1822); and *Evenings on the Thames* (2 vols., 1860).

DIG'-DIG' or **DIK'-DIK'** (Arabic). See Gazelle.

DIGEST. A topical arrangement or compilation of legal rules, judicial decisions, or statutes, in condensed form; particularly, the authoritative compilation of the civil law, otherwise known as the Pandects, made under the authority of Justinian (530-533). See Civil Law; Code; Pandects.

In English and American law the term is applied to a great number and variety of legal works of reference, ranging from such encyclopædic collections of special treatises as Bacon's and Viner's Abridgments and Comyn's Digest, to the alphabetical arrangements of statutes and of case law which have monopolized the title in recent years. The former kind of digest was a favorite form of legal authorship in the earlier period of the common law, and several of these compilations—as those of Statham (about 1470), Fitzherbert (1516), Brooke (1568), and Rolle (1668)—long maintained a high position as legal authorities. The earliest of these are still useful as containing references to cases as yet buried in the Year-Books and other early reports. As authorities, however, they have all been superseded in the estimation of lawyers by more systematic treatises.

The modern digest of case law is in effect an elaborate index to the enormous collections of judicial decisions in which the common law of Great Britain and of the United States lies imbedded. The most authoritative of the English digests are those of Fisher and Chitty. Each American State has one or more of such compilations, of which Abbott's Cyclopædic Digest of New York decisions is perhaps the most extensive and complete. There are also digests of the Federal reports, of the United States statutes, and a comprehensive compilation of all the Federal and State reports, known as the Century Digest. The plan of all these digests of case law is substantially the same, consisting of an alphabetical arrangement of legal titles, under which are given brief statements of the rule or doctrine enunciated in each decision, together with the title and location of the case in which the decision was rendered. (See Abridgment; Report.) Consult: Wambaugh, *The Study of Cases* (2d ed., Boston, 1894); Lindley, "The History of Law Reports," *Law Quarterly Review* (London, 1885).

DIGESTER. A name originally applied to a strong boiler, with a closely fitting cover, in which bones or other animal substances, placed in water, could be raised to a temperature above the boiling point, or 212° F. The word is now given a wider meaning; the material may be placed in some liquid other than water, and chemical action instead of heat may be used to effect the disintegrating process. The digester, in its simplest form, was invented in 1681 by Denis Papin (q.v.), a French scientist. It is made of iron or other metal, and has an air-tight cover, provided with a safety-valve, from which steam may be allowed to escape when the pressure becomes too great. The increased pressure to which the contents of the boiler are exposed raises them to a much higher temperature than could be secured in an open vessel, reaching at times 400° F. At such a temperature bones will dissolve. In its modern form, the Papin digester is put to much wider uses than the mere preparation of soup and extraction of gelatin from bones, for which it was originally intended. One application of the invention is the lard or grease tank, which is an essential feature of a large modern slaughter-house. Into such tanks the carcasses of animals too poor for the regular market and the entrails and grease-yielding offal of other animals are thrown. Steam is applied, which resolves the contents of the tank into fat; water, which contains much soluble matter in solution; and mud, containing earthy and solid particles, the contents arranging themselves in layers, from top to bottom, in the order named, according to their specific gravity. The tank is usually a vertical cylinder, with a perforated false bottom, which holds the charge and at the same time allows the water of condensation to percolate into the lower chamber. There is a discharge hole at the bottom for removing the residuum, and a number of try-cocks are arranged along the sides, by means of which the level of the fats and water may be ascertained. There may be two discharge cocks; through the higher one the floating fat may be decanted and through the lower one the water may be drawn off, as the contents and state of the process require. In some forms of digesters, like those for treating garbage, the water and grease may be drawn off together, and separated afterwards. The solid matter, called tankage, may be pressed or dried, or both, and is oftentimes utilized for various purposes.

A familiar example of a chemical digester is the apparatus for extracting tannin from nut-galls by means of ether. The nut-galls are placed in a vessel saturated with ether; the volatile extract falls into a closed vessel placed below and connected by means of a pipe with the top of the other vessel, to prevent the escape of the ether.

DIGESTION in Animals. See Food.

DIGESTION (Lat. *digestio*, from *digerere*, to digest) in Plants. The process by which foods are rendered fit for absorption, conduction, or assimilation (qq.v.). Foods are sometimes insoluble in water, or, when soluble, need to be altered to make them more readily diffusible or usable. Since no substances can be absorbed except in solution in water, and since protoplasm and cell-walls offer resistance to the movement of foods having large molecules, digestion is necessary.

There are no special digestive organs in plants corresponding to the alimentary tract of animals, and comparison of leaves to the stomach is entirely misleading. Digestion may occur outside the plant body to make foods soluble and prepare them for absorption. Or it may occur in the interior of any cell of any organ, though it is naturally most active in those cells which contain the largest quantities of foods that are to be rendered available for growth and repair. In both cases digestion is accomplished by the protoplasm. Doubtless the protoplasm may act directly, but in most cases it digests foods by secreting enzymes (q.v.) to do the work. Enzymes may be produced in all the cells of an organ, e. g. in leaves, tubers, the mycelium of a fungus; or in certain cells, free of reserve food, e. g. nasturtium and other Cruciferæ; or in definite groups of cells constituting a gland (q.v.), e. g. garden nasturtium; or in a glandular epidermis, e. g. on the embryo of grasses; or in superficial glands, e. g. saxifrage and insectivorous plants. (See Secretion.)

Each prominent food is acted upon by a particular enzyme adapted to transform it. The following table shows the principal sorts of plant-foods, the enzymes by which they are digested, and the most important products formed.

I. Carbohydrates

Food	Enzyme	Product
Starch	diastase	maltose dextrin
Inulin	inulase	levulose
Cellulose	cytase	a variety of sugar
Saccharose	invertase	glucose fructose
Maltose	glucase	glucose
Pectins	pectase	pectic acid
II. Proteids		
Albumins Globulins	trypsin	peptones and finally amides
III. Other Foods		
Glycerides (fats)	lipase	glycerin fatty acid
Glucosides	emulsin	glucose and various substances

Some of the more prominent examples of digestion may be mentioned. When a fungus lives upon or in a dead or living body, it secretes enzymes which digest such of the substances it comes in contact with as it can attack; these may then be absorbed and used for its nourishment. During the day the leaves of green plants form carbohydrates faster than they can be carried away, and a portion is stored temporarily in the chloroplasts (q.v.) as starch-granules. Later, and especially during the night, when no food is formed, these starch-grains are digested and transferred to places of use or permanent storage. Toward spring potatoes lose their mealiness when cooked, and become gummy and sweetish on account of the digestion of starch into sugar by diastase. When the shoot starts to grow the process is hastened. In the germination of spores and seeds, the stored foods, usually starch, oils, and proteids, are digested by appropriate enzymes, and the materials thus made available for the growing parts.

DIGESTION, Comparative Physiology of. See Alimentary System, Evolution of.

DIGESTION, Organs and Process of, in Man. The process of digestion is one of the chief of those organic functions directly concerned in maintaining the life of the individual, inasmuch as it is that through which the animal is enabled to receive aliment, and to prepare it to be appropriated by the various organs of the body. The general expression, 'function of digestion,' includes several minor or subordinate processes. According to Milne-Edwards, the acts of the digestive function may be classed as follows: (1) The prehension of the food; (2) its mastication; (3) its insalivation; (4) its deglutition; (5) its chymification or stomachal digestion; (6) its chylification or intestinal digestion; (7) defecation; and (8) the absorption of the chyle. Before examining these acts in succession, and the mechanism by which each is effected, we must have clear conceptions regarding the classification of food, the quantity of food, and other allied subjects, which are discussed in the article Food; and we must likewise have some knowledge of the causes of those sensations which we call *hunger* and *thirst*, which are, or ought to be, our natural guides regarding the periods for taking food and the quantity to be taken. The immediate cause of ordinary hunger cannot be explained; but that it is due to some peculiar condition of the gastric mucous membrane seems probable from the fact that the sensation continues after division of the pneumogastric nerves, from which the stomach mainly derives its nervous fibres, if we correctly interpret the feelings of the animals on which the experiments were made. In extreme hunger, the sufferer complains of a sense of sinking, which is referred to the region of the stomach, while general faintness and sometimes considerable pain are present. Hunger, or the want of food which occasions it, may be diminished by rest, sleep, or any cause that retards the general change which is perpetually going on in all the tissues of the body. Tobacco and alcohol tend to limit the disintegration of the tissues, and thus to keep off or diminish hunger. When the sensations of extreme hunger are not relieved by food, the body begins to feed upon its own tissues, and the symptoms of starvation (q.v.) begin to manifest themselves. The period at which death occurs from abstinence varies greatly in different animals—young animals always dying sooner than older ones. In man, total privation of food usually causes death in about a week; but if a little drink be allowed, life is considerably prolonged. Thirst is dependent upon a peculiar condition (probably undue dryness) of the mucous membrane of the upper part of the digestive tube. The thirst in febrile affections is, however, probably due to the morbid state of the blood.

We now proceed to the consideration of the different acts of which the digestive function is made up.

(1) In the act of prehension, man and the other vertebrates employ the hands or anterior extremities and mouth, the lips and anterior teeth, and, to a certain extent, the tongue. The prehension of fluids is effected in two ways; sometimes the liquid is poured into the mouth, and is allowed to fall down the throat; in other cases, the tongue is used after the fashion of a piston, being drawn within the mouth so as to exhaust the anterior part of that cavity, and fluids are thus forced to enter by atmospheric pressure.

(2) Mastication is effected in the cavity of the mouth by means of the teeth (q.v.), or, in their absence in some animals, by hardened surfaces that perform their functions. The upper jaw is immovable; but the lower jaw, with its teeth, is capable of moving in all directions by means of powerful muscles. It is by the varied movements of the lower teeth against the upper, through the action of these muscles, that the food is broken down or masticated. This operation is very important, since the more the food is broken down the more easily will it mix with the saliva and other fluids which participate in the digestive process.

(3) Insalivation is effected by the admixture of the secretions of the three pairs of salivary glands (the parotids, the submaxillaries, and the sublinguals) and of the buccal mucus with the triturated food. (See Gland.) The common saliva is a colorless, turbid, viscid, inodorous, and tasteless fluid, which, after standing for some time, deposits a layer or pavement epithelium (see Epithelium) and mucus corpuscles. In the normal state, its reaction is alkaline, but the degree of alkalinity varies, and is greatest during and after meals. Saliva does not contain more

than five or six parts of solid constituents to 995 or 994 parts of water, the most important ingredient being an organic matter termed *ptyalin*, and sulphocyanide of potassium, neither of which substances occurs in any other solid or fluid of the body. The daily quantity of saliva secreted by an adult man is estimated at about 48 ounces, but the activity of the salivary glands is dependent upon various influences and conditions. Thus, movement of the lower jaw, as in masticating, speaking, or singing, increases the secretion; as also do acrid and aromatic substances, and dry, hard food; while the use of moist and soft food is accompanied by a scanty secretion. The uses of saliva in reference to digestion are partly mechanical and partly chemical. The moistening of the dry food by the saliva serves the double purpose of adapting it for deglutition and of separating the particles, and thus allowing them to be more freely acted on by the other digestive fluids; moreover, from its viscidity, it lubricates the bolus of food, and thus facilitates deglutition; and it is probably also subservient to the sense of taste. The great chemical use of the saliva is to convert the amylaceous (or starchy) portion of the food into glucose or grape-sugar, and thus to promote its absorption.

(4) Deglutition is the act by which the food is transferred from the mouth to the stomach. The pharynx, or cavity into which the mouth leads, takes so slight a part in the digestive process, that we need scarcely allude to any anatomical details connected with it. It is sufficient to observe that between it and the mouth is the pendulous or soft palate, which is a movable muscular partition that separates the two cavities during mastication. As soon, however, as the latter act is accomplished, and the bolus is pressed backward by the tongue, the soft palate is drawn upward and backward, so as to permit the passage of the food into the pharynx. The bolus or pellet of food having arrived near the œsophagus or gullet (which is continuous inferiorly and posteriorly with the pharynx), is driven into it by the action of certain muscles, which almost surround the pharynx, and are termed its *constrictor* muscles. All voluntary action ceases as soon as the food is pressed backward by the tongue into the pharynx. It is impossible to recall the pellet, and it is necessarily carried on (without even our cognizance) into the stomach. On receiving the food forced into its upper extremity by the action of the constrictor muscles of the pharynx, the œsophagus is dilated (for it usually lies in a collapsed state, with its walls in contact, or nearly so); this contact of the pellet with its mucous membrane causes its muscular walls to contract, and the food is thus driven, by a series of these contractions, into the stomach. The act of deglutition is now completed.

(5) Stomachal digestion or chymification is the next process to be considered. The whole of the alimentary canal (Fig. 1) below the diaphragm (q.v.), or great muscular partition which separates the cavity of the chest from that of the abdomen or belly, possesses the following characteristics, in relation to structure: The stomach, the small intestine, and the large intestine are all lined by mucous membrane, have a muscular coat, consisting of two sets of distinct fibres—namely, circular fibres which surround the tube or viscus after the manner of a series of rings, and longitudinal fibres running in the same direction as the intestine itself—and are invested with a serous membrane, the peritoneum (see SEROUS MEMBRANES), which at the same time retains the viscera in their proper position, and permits their necessary movements.

The human stomach is an elongated curved pouch, lying almost immediately below the diaphragm, and having the form of a bagpipe. It is very dilatable and contractile, and its function is to retain the food until it is duly acted upon and dissolved by the gastric juice, which is secreted by glands lying in its inner or mucous coat, and then to transmit it, in a semi-fluid or pulpy state, into the duodenum. Its average capacity is about five pints. The parts of it which have received special names are the greater curvature (Fig. 1) *b*, the lesser curvature, upon its upper border, and the cardiac, *c*, and pyloric, *d*, extremities.

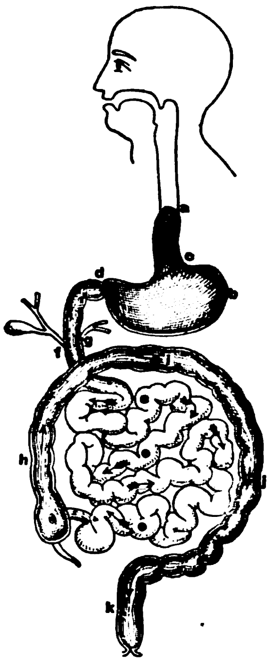


FIG. 1. HUMAN ALIMENTARY CANAL.

a, œsophagus; *b*, stomach; *c*, cardiac orifice; *d*, pylorus; *e*, small intestine; *f*, biliary duct; *g*, pancreatic duct; *h*, ascending colon; *i*, transverse colon; *j*, descending colon; *k*, rectum.

The mucous membrane, or lining coat of the stomach, is thick and soft, and lies in irregular folds, in consequence of the contraction of the muscular coat, unless when the organ is distended with food. On opening the stomach, and stretching it so as to remove the appearance of folds, we perceive even with the naked eye, but better with a lens, numerous irregular pits or depressions, irregular in shape, and averaging about 1-200th of an inch in diameter. To see them properly, the mucus with which they are filled must be washed out (Fig. 2, A). These pits are so shallow as not to dip into the mucous membrane to a greater extent than one-sixth or one-eighth of the thickness. The rest of the thickness is chiefly made up of minute tubes, running parallel to one another, and vertically to the surface of the stomach (Fig. 2, B). These are the gastric tubes or glands which secrete the gastric juice from the blood in the capillaries which abound in the mucous membrane. They pass in twos, threes, or fours from the bottom of each pit, and usually subdivide into several tubes, which, after running a more or less tortuous course, terminate in blind or closed extremities. These tubes are filled with epithelial cells, whose contents are composed of granules, with which oil-globules are often mixed, and each tube is invested with capillaries, which usually run in the direction of its long axis. In the pyloric or duodenal end of the stomach, these tubes (at least in the dog and several other animals whose stomachs have been carefully examined in a perfectly fresh state) are considerably wider than those which we have described, and differ from them also in other respects; and hence some physiologists believe that while they collectively secrete the gastric juice, one set may secrete the acid fluid and the organic matter termed pepsin, and the other mucus; the free acid and the pepsin are, as we shall shortly see, the two essential constituents of the gastric juice.

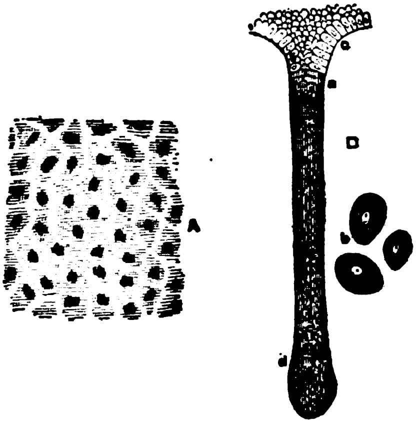


FIG. 2.

A, inner surface of the stomach, showing the cells after the mucus has been washed out, magnified 25 diameters. B, stomach-tube from the middle of the human stomach, magnified about 150 diameters; *a*, wall of the tube, lined with large oval nucleated cells; *b*, the same cells isolated; *c*, nucleated cells of columnar epithelium, occupying the upper parts of the tubes; *d*, blind extremity of the tube.

When food is introduced into the stomach, three special phenomena are induced in that viscus: (1) Certain movements dependent on the muscular coat; (2) the mucous membrane is altered in appearance; and (3) gastric juice is secreted. Each of these phenomena requires a brief notice.

On killing an animal while the act of digestion is going on, and at once laying open its abdomen, we find that the stomach is in a contracted state, firmly embracing its contents, and with both its orifices so closed as to prevent the escape of the food, this contraction being due to the stimulation of the muscular coat by the food. If we examine the movements of the stomach during digestion, which we can do either by exposing the stomach of a living animal, or by sending a magneto-electric current through this organ in an animal just killed, we perceive that, in the cardiac half or two-thirds, the movements are extremely slow, the muscular coat apparently contracting on the food, and progressively sending it toward the pylorus; while in the pyloric end of the stomach the movements are more energetic and rapid, resembling the peristaltic or vermicular movement, which we shall presently describe as occurring in the intestinal canal. When the transverse constriction has reached the firmly shut pylorus, a relaxation lasting about a minute ensues, followed by a repetition of the circular contractions. The movements which these contractions impress upon the food have been described in the following terms: "The food entering the cardiac end of the stomach, *c*, turns to the left, descends into the splenic extremity and follows the great curvature toward the pyloric end, *d*. It then returns in the course of the smaller curvature, and makes its appearance again at the cardiac aperture in its descent into the great curvature to perform similar revolutions. These revolutions are effected in from one to three minutes." This account, given by Dr. Beaumont, is based on the observations which he made in the stomach of Alexis Saint Martin, a Canadian, with a fistulous opening into the stomach. (See BEAUMONT.) Dr. Brinton, however, adopts a modified view, which is probably the correct one. He supposes that the semi-fluid food entering at *c* (Fig. 3), the cardiac orifice, goes in the directions marked *a*, partly along the greater and partly along the lesser curvature; and that these two currents of food meet at the closed pylorus, when they are both reflected into the direction *b*, forming a central or axial current, occupying the real axis of the stomach, which unites the two apertures. The mutual interference of these currents at their borders causes a uniform admixture of the various substances composing them, while the reflection of the upper and lower currents into one another insures an equal contact of all the mass with the secreting surface of the mucous membrane.

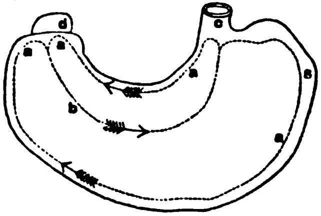


FIG. 3. Diagram to show the general direction of movement impressed on the semi-fluid food in the stomach.

aa, the hemispherical or surface current, carrying the semi-fluid food toward the closed pylorus, where it is deflected into *b*, the central current, which unites the cardiac (*c*) and pyloric (*d*) openings.

The changes in the mucous membrane are mainly the following: The inner surface of the healthy fasting stomach is of a paler pink tint than after the introduction of food, and while in the latter case the reaction of the moisture on the surface is very acid, in the former it is neutral, or even alkaline. Dr. Beaumont found (in the case of Alexis Saint Martin) that, on the introduction of food into the stomach, the vessels of the mucous membrane became more injected, and that its color changed from a pale pink to a deep red. A pure, colorless, and slightly viscid fluid, with a well-marked acid reaction, was then observed to distill from the surface of the membrane, and to collect in drops, which trickled down the walls, and mixed with the food.

That the *gastric juice*, which is the term applied to the acid fluid which Dr. Beaumont saw exuding from the mucous membrane, and which is secreted or formed in the gastric tubes, which we have already described, is capable of exerting a solvent action on food, is proved by numerous experiments. It was first ascertained by Réaumur (1752), who obtained some of this fluid by making animals swallow sponges with a string attached, by which he could withdraw them. He thus showed that alimentary substances out of the body were altered by this fluid in the same manner as they are changed in the stomach, and disproved the favorite theory of that period, which ascribed all the changes which the food underwent in the stomach to a species of trituration. The subject of *artificial digestion*, or digestion out of the body, has, since that period, been carefully investigated by many observers, and there is now no doubt that the changes which the food undergoes in the stomach are essentially chemical, and not mechanical.

Two years before Beaumont's experiments, Dr. Prout had ascertained not only that an acid fluid is secreted by the gastric mucous membrane of rabbits, hares, horses, dogs, etc., during digestion, but that the acid is the muriatic or hydrochloric acid, and it was supposed that the solvent action of the gastric juice was due to this source. But experiments showed that the solvent action is not due simply to the acid of the gastric juice, and that the latter must contain some other ingredients which, either alone or in combination with the acid, can exercise this power. It was then discovered that the addition of a portion of the gastric mucous membrane to water acidified with hydrochloric acid produced a perfect digestive fluid, due attention being paid to the temperature, which should be kept at about 100° F., or about the normal temperature of the interior of the animal body. Later observations showed that we can obtain from the gastric mucous membrane the special organic matter on which its digestive power depends, and to this substance the name of *pepsin* has been given. The two essential elements of the gastric juice are, then: (1) a free acid, which in some cases seems to be hydrochloric alone, and in others a mixture of hydrochloric and lactic acids; and (2) an organic matter, which is found on analysis to be highly nitrogenous, and to be allied to the albuminates, and which we term pepsin. The best analysis of human gastric juice is that made by Schmidt of Dorpat, who, in 1853, had an excellent and rare opportunity of examining it in the case of an Esthonian peasant, Catharine Kütt, aged thirty-five years, and weighing about 118 pounds, in whom there had existed for three years a gastric fistula or opening, three or four lines in diameter, under the left breast, between the cartilages of the ninth and tenth ribs. The introduction of dry peas and a little water into the stomach through the opening (even in the morning, on an empty stomach) occasioned the secretion of from five to seven ounces of a clear limpid fluid with an acid reaction, which, however, was much less strong than Schmidt had observed in previous experiments on the gastric juice of dogs and sheep, in which he had artificially established similar fistulous openings. The following table gives the mean of two analyses of the gastric juice of Catharine Kütt, with corresponding mean results of the same fluid in the sheep, a purely herbivorous animal, and in the dog, a purely carnivorous animal:

	Human gastric juice	Sheep's gastric juice	Dog's gastric juice
Water	994.40	986.15	971.17
Solid constituents	5.60	13.85	28.83
Pepsin	3.20	4.20	17.51
Hydrochloric acid	0.20	1.56	2.70
Chlorides of sodium, etc.	2.08	6.00	5.88
Phosphates	0.12	2.09	2.74

The only impurity that could affect these analyses is the saliva that possibly might have been swallowed.

The quantity of the gastric juice secreted in twenty-four hours was determined by Bidder and Schmidt (*Die Verdauungssäfte*, etc.) in the sheep to be one-eighth, and in the dog one-tenth of the weight of the body. If the latter ratio were true for men, a man of 140 pounds' weight would secrete about 14 pounds of this fluid daily. In the case of Catharine Kütt, the mean daily quantity amounted to no less than 31 pounds, or to more than a fourth part of the weight of her body. On this calculation, a man of 140 pounds weight would daily secrete 37 pounds of gastric juice.

The uses of this fluid in reference to digestion are clear. It serves not only to dissolve, but also to modify the nitrogenous elements of the food (such as albumen, fibrin, casein, and, in short, all animal food except fat, and the blood-forming portion of vegetable food), converting them into new substances, termed *peptones*, which, although they coincide in their chemical composition, and in many of their physical properties, with the substances from which they are derived, differ essentially from them in their more ready solubility in water, and in various chemical relations. Thus, albumen is converted by the gastric juice into albumen-peptone, fibrin into fibrin-peptone, etc. According to the investigations of Meissner, the albuminates are simultaneously decomposed or broken up into peptones and substances which he terms *parapeptones*, which latter are not further changed by the action of the gastric juice, but are converted into peptones by the action of the pancreatic juice, with which they come in contact in the duodenum.

All the best observers agree that the gastric juice exerts no apparent action on the non-nitrogenous articles of food—namely, the fats and the carbohydrates (sugar, starch, etc.); as, however, the fats exert a favorable influence on the digestion of nitrogenous matters, it is probable that they undergo some slight, although not appreciable, modification. Gelatin and the gelatinous tissues are, as far as is known, the only nitrogenous articles of food which are not converted into peptones and parapeptones by the action of the gastric juice.

Although the main object of the gastric juice is to dissolve the albuminates, etc. (e.g. the contents of the egg, flesh, cheese, etc.), it appears from the experiments of Lehmann, Schmidt, and others, that it cannot dissolve the quantity necessary for the due nutrition of the organism. According to Lehmann, gastric juice can only dissolve one-twentieth of its weight of coagulated albumen, while Schmidt makes the quantity as low as one-forty-fifth. Now, since a dog secretes about one-tenth of its weight of gastric juice daily, it would only be able—even taking Lehmann's estimate, which is more than twice as high as Schmidt's—to digest five parts of dry or coagulated albumen for every 1000 parts of its weight; but a dog, in order to keep in condition on an exclusive flesh diet—and this is its natural food—should take 50 parts of flesh, containing 10 parts of dry albuminates, for every 1000 parts of its weight. Hence its gastric juice only suffices for the digestion of half the albuminates necessary for nutrition—a result which is in accordance with the observed fact that a considerable portion of the albuminates enters the duodenum in an undissolved state, and which will be explained when we consider the part which the intestinal juice—the fluid secreted by the various glands lying in the mucous membrane of the small intestine—takes in the digestive process. On comparing the experiments made on dogs with those made on Catharine Kütt, it appears that in the human subject the gastric digestion of the albuminates is much more imperfect than even in the dog.

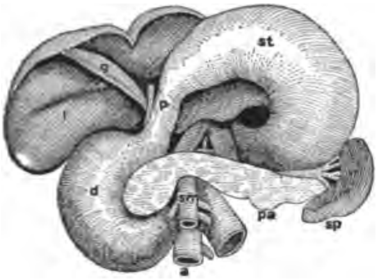


FIG. 4. The under surface of the stomach and liver, which are raised to show the duodenum and pancreas.
st, stomach; *p*, its pyloric end; *l*, liver; *g*, gall-bladder; *d*, duodenum, extending from the pyloric end of the stomach to the front, where the superior mesenteric artery (*sm*) crosses the intestines; *pa*, pancreas; *sp*, spleen; *a*, abdominal aorta.

The process of gastric digestion is slow. According to Beaumont's researches on Alexis Saint Martin, the mean time required for the digestion of ordinary animal food, such as butcher's meat, fowl, and game, was from two hours and three-quarters to four hours.

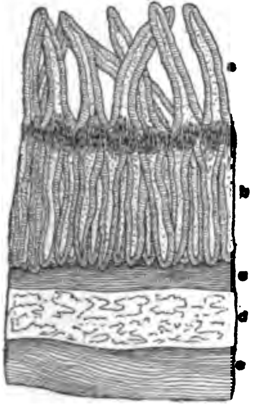


FIG 5. Vertical and longitudinal section of the small intestine in the lower part of the jejunum, showing the general arrangement of its coats.
a, villi; *b*, intestinal tubes or follicles of Lieberkuhn; *c*, submucous areolar tissue; *d*, circular muscular fibres; *e*, longitudinal muscular fibres.

Frerichs and Donders maintain that the absorption of the peptones commences in the stomach; but the view generally adopted is, that the albuminates, etc., which are converted into peptones, are for the most part taken up by the lacteals. The rapidity with which aqueous solutions of iodide of potassium, the alkaline carbonates, lactates, citrates, etc., pass into the blood, and thence into the urine, saliva, etc., shows that the absorption of fluids must take place very shortly after they are swallowed, and there is little doubt that the blood-vessels (capillaries) of the stomach constitute the principal channel through which they pass out of the intestinal tract into the blood. As the veins of the stomach, which are formed by the union of these capillaries, contribute to form the portal vein (see CIRCULATION), the absorbed matters pass directly to the liver, and probably stimulate it to increased secretion (Fig. 4).

(6) We must now follow the progress of the semi-fluid mass, known as the *chyme*, from the stomach into the small intestine, and notice the changes which are collectively impressed upon it, and are known as *chylification* or intestinal digestion. But before we can satisfactorily do this, we must say a few words regarding the intestinal mucous membrane, with its various glands, etc., and on the changes which take place in it during digestion.

The mucous membrane of the small intestine resembles that of the stomach in so far as it is of considerable thickness, and consists in a great measure of laterally grouped tubes. The reader is referred to Fig. 5, which exhibits a section of the mucous membrane of the small intestine in the dog. The tubes, which form the great mass of the middle portion of the section marked *b*, are commonly called the *follicles of Lieberkuhn*, although they were first described by Brunner. They are straight, nearly uniform in diameter throughout their entire length, and are parallel to one another, and perpendicular to the inner surface of the small intestine on which they open. Nothing is known of the exact nature of their secretion; but in association with the secretions of other glands, they combine to yield the intestinal juice whose characters and uses will shortly come under our notice.

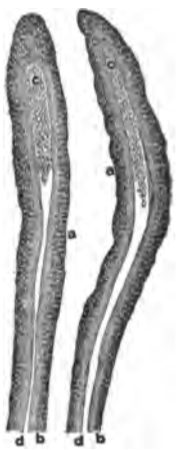


FIG. 6. Two villi, denuded of epithelium, with the lacteal vessels in their interior.
a, limitary membrane of the villus; *b*, basis of the same; *c*, dilated blind extremity of the lacteal; *d*, trunk of the same.

The projecting bodies marked *a* in the figure are termed the *villi;* they are minute processes of the mucous membrane of the small intestine, and obviously serve to increase to a great extent the amount of absorbing mucous membrane. They first appear in the duodenum, where they seem to develop themselves as elongations of the partitions between the cells or pits into which the tubes open. Comparatively scanty in number at first, they become very numerous (covering the whole surface) in the further part of the duodenum and the rest of the small intestines, giving to the mucous membrane a velvet-like or pilous appearance; they finally cease at the ileo-cæcal valve, which forms the boundary between the small and large intestine. In man, they are conical in shape, and measure from one-forty-fifth to one-sixtieth of an inch in length. They vary much in shape and size in the lower mammals and in birds. (In carnivorous animals, as the dog, they are longer and more filiform than in man.)

The structure of a villus (Fig. 6) is somewhat complicated, but we must endeavor to explain it, because, without tolerably accurate knowledge on this point, no one can understand how most of the essential elements of food (the albuminates and fatty matters) make their way from the intestine to the blood. Each villus is provided with an abundant set of capillaries, which doubtless absorb fluid matters, which thus find their way directly from the bowels into the blood

(Fig. 7). A single artery enters its base, and passing up its centre, divides into a capillary plexus, which almost surrounds the villus immediately beneath the mucous membrane. From these arise small veins, which usually pass out of the villus in two, three, or more trunks, and contribute to form the portal vein. See CIRCULATION.

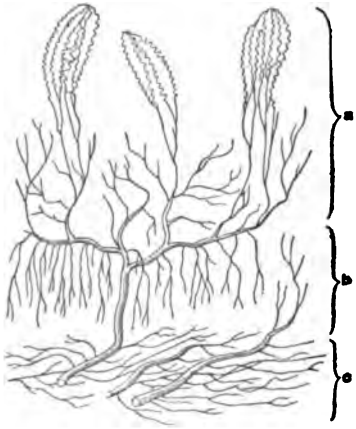


FIG. 7. Vertical section of the coats of the small intestine, showing the capillaries and the beginnings of the portal vein. The arteries are not seen, not having been penetrated by the injection which has been thrown into the portal vein.

a, vessels of the villi; *b*, those of the tubes or follicles of Lieberkuhn; *c*, those of the muscular coat.

The villus also contains in its interior one or more *lacteals*, which are vessels with club-shaped closed extremities, which absorb the chyle from the intestine. Their milk-white appearance, when they are filled with chyle, suggests the origin of their name. The tissue which occupies the cavity of the villus, in which the lacteals are imbedded, and which supports the capillary plexus, is in a great measure made up of nuclei and granules, except at the free extremity, where a vesicular structure, resembling very minute fat-globules, is apparent.

There is abundant evidence that the function of the villi is connected with absorption, and mainly with the absorption of chyle: (1) The villi exist only in the small intestine, where the absorption of food chiefly goes on. (2) They are most developed in that part of the intestine where chyle is first formed. (3) They are turgid, enlarged, and opaque during the process of chylification, and small and shrunken in animals that have been kept fasting for some time before death.

In addition to the villi, the mucous membrane of the small intestine presents numerous transverse folds, which are termed the *valvulæ conniventes*, from their valvular form and from their movements under water resembling the winking motion of the eyelids (Fig. 8). Each fold passes round three-fourths or more of the gut; and in the lower part of the duodenum, and in the jejunum (the parts in which they are most fully developed), they are often more than half an inch in depth; further on they diminish in depth, length, and number, and in the lowest part of the ileum they can scarcely be traced. Their object clearly is to increase the extent of the absorbent mucous membrane.

In addition to Lieberkuhn's follicles or tubes, which exist in the whole of the smaller intestine, there are other glandular or secreting structures, imbedded in the submucous tissue of certain portions of the intestinal tract, which require consideration. These are: (1) Brunner's glands (q.v.), which occur only in the duodenum; (2) solitary glands, which seem to occur in all parts of the intestines, both small and large; and (3) Peyer's glands, which are usually confined to the ileum.

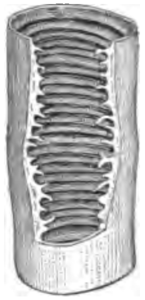


FIG. 8. Small intestine distended and hardened by alcohol, and laid open to show the valvulæ conniventes.

Brunner's glands are most abundant at the pyloric end of the duodenum. In structure they resemble the pancreas, their ultimate elements being bunches of vesicles, from which minute ducts arise, which coalesce and form larger ducts, through which the secretion is poured into the duodenum. It is believed that they secrete a fluid similar to the pancreatic juice. The *solitary glands* occur in all parts of the intestine, but are perhaps more numerous in the jejunum than elsewhere. Each gland is a simple membranous flask-shaped vesicle, the neck corresponding to the surface of the intestine, while the rounded base lies in the submucous tissue. The neck presents no opening, and how the contents, which consist of nuclei and granular particles, are discharged into the intestine is not clearly known. As we never see them larger than a mustard-seed, we may presume that on attaining that size they burst. *Peyer's glands* (Fig. 9) are apparently mere aggregations of solitary glands, forming oval patches in the ileum. These patches vary in size and number, being largest toward the cæcum, where their long diameter sometimes measures three or four inches, and smallest toward the jejunum, where their number varies from fifteen to twenty, or even more. Nothing certain is known regarding the uses of these solitary or aggregated glands; but as they are largest during the digestive process, we must infer that they are in some way connected with

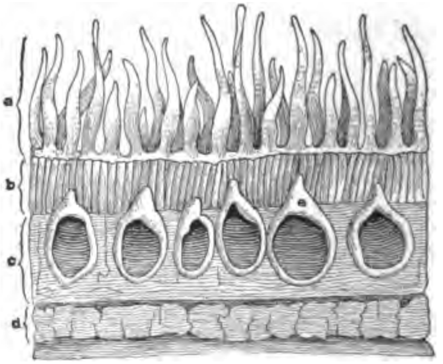


FIG. 9. Vertical section through a patch of Peyer's glands in the dog.

a, villi; *b*, tubes of Lieberkuhn; *c*, submucous tissue, with the glands of Peyer imbedded in it; *d*, muscular and peritoneal coats; *e*, apex of one of the glands projecting among the tubes.

that function. Possibly the peculiar odor of the fæces may be due to their secretion. In typhoid or enteric fever, and in phthisis, these glands become ulcerated, which probably occasions the diarrhœa so common in these diseases.

Brunner's glands are much more developed in the herbivora than in the carnivora; Peyer's, on the other hand, are most developed in the latter.

We have endeavored, in the preceding sentences, to give the reader some idea of the complicated structure of the mucous and submucous coat of the small intestines; we now proceed to notice the chief uses of the muscular coat of the intestine. This coat, as has been already mentioned, consists of two layers of muscular fibres—namely, circular and longitudinal fibres, of which the former lie next to the submucous coat. The peristaltic or vermicular action, by which the substances which enter the duodenum from the stomach are moved onward, is due to this muscular coat. A person who has once seen the abdomen of an animal laid open immediately after death will have a better idea of the nature of this movement than can be afforded by any description. It commences about the pyloric third of the stomach, whence successive wave-like movements are propagated through the entire length of the intestinal canal. It is the rapid succession of these alternate contractions and relaxations that impels the intestinal contents onward, and occasions those movements which, from their resemblance to the writhings of a worm, have been termed *vermicular*. It is very probable that the rapidity of this movement varies in different individuals—those persons, for example, whose bowels act twice daily having a more rapid vermicular motion than those in whom the act of defecation occurs only once in the twenty-four hours.

We have now to consider the effects produced on the chyme by the different fluids with which it becomes mixed in the small intestine. These fluids are: (1) The bile; (2) the pancreatic juice; and (3) the intestinal juice.

The bile (q.v.) is a faintly alkaline or neutral fluid containing two essential constituents, one of which is of a resinous nature, while the other is a pigment. The resinous constituent is not precisely identical in all kinds of bile, but it generally consists of a soda salt whose acid is either glycocholic or taurocholic acid, or of a mixture of these salts. Strecker, to whom we are mainly indebted for our knowledge of the chemistry of the bile, states that in most mammals the resinous constituent merely differs in the varying proportions in which the taurocholates and glycocholates are intermixed, the former usually preponderating. According to Lehmann, the resinous constituent amounts to at least 75 per cent. of the solid residue. The bile pigment occurs in the bile of different animals under two forms—namely, as a brown and as a green pigment, the latter probably only differing from the former in being more highly oxidized. There has never been a case in which physiologists have had an opportunity of directly observing the quantity of bile that is secreted by the human subject, and all our information on this subject is derived from observations on animals in which the common bile-duct (see LIVER) has been tied and a fistulous opening established into the gall-bladder. If the same proportion of bile to bodily weight holds good in man as in the dog, a man weighing 140 pounds would secrete daily about five pounds of bile. All observers agree that the amount of the biliary secretion varies directly with the quantity of food; and as animals with biliary fistulæ (in whom all the bile escapes externally, instead of making its way into the duodenum) usually have voracious appetites, experiments on this point are easily made. There is great discrepancy of opinion as to how soon after a meal the bile flows most abundantly into the intestine. According to Kölliker and Müller, whose experiments were made on dogs fed only once a day, very little bile is secreted in the first and second hour after a meal, more in the third, fourth, and fifth, the maximum being sometimes attained in the fifth, sometimes not till the eighth hour.

Numerous and somewhat discrepant views have at different times been advanced regarding the functions of this fluid; we shall here notice only those functions which are connected with digestion. One use that has been ascribed to it is to neutralize in the small intestine the acid chyme which emerges from the stomach. But the bile can contribute little or nothing to the neutralization of the free acid, because, in the first place, the bile is very slightly alkaline, and often perfectly neutral; and, secondly, because the chyme in the intestine is still acid after the admixture of the bile. Again, the bile has been asserted to possess a special solvent action on the chyme; but none of the ordinary constituents of the latter seem to be essentially changed, even when digested for a long time with fresh bile. Again, much importance has been attached to the antiseptic action of the bile on the contents of the intestinal canal, in favor of which view it is alleged that when no bile is poured into the intestine the fæces have a putrid odor, as is sometimes observed in patients with jaundice, and as was noticed by Frerichs in animals in which the common bile-duct had been tied. Another use that has been assigned to the bile is that it exerts a stimulating action on the intestinal walls, and thus acts as a natural purgative; and in support of this view it may be mentioned that jaundice (in which the bile does not flow into the intestine) is often accompanied by extreme constipation, and that purified ox-gall, taken either in the form of pill or enema, produces an undoubted purgative action. But the main use of the bile seems to be to promote the digestion of fatty matters; and it accomplishes this end not so much by any solvent chemical action on the fats (which at most is extremely slight), as by a peculiar physical action both on the fats and on the intestinal walls, disintegrating the former and impressing on the latter (by moistening the villi) a peculiar condition which singularly facilitates the absorption of fatty matters. This view is fully confirmed both by direct experiments out of the body and by comparing the relative qualities of fat that are retained in the body and applied to the purposes of life by animals with biliary fistulous openings and by healthy animals.

The pancreatic fluid which is poured into the duodenum at the same spot with the bile (see Fig. 1) is a colorless, clear, somewhat viscid and ropy fluid, devoid of any special odor, and exhibiting a strong alkaline reaction. This fluid, as yielded by different dogs with permanent fistulous openings, varies considerably in chemical composition, the collective solid constituents ranging from 1.5 to 2.3 per cent., the organic matters from 0.9 to 1.6, and the mineral matters from 0.62 to 0.75.

The most abundant and important of the solid constituents is a peculiar substance termed *pancreatine*, or pancreatic diastase or ferment, in combination with soda, to which this fluid owes its principal chemical and physiological properties. Calculating from the quantity of pancreatic juice secreted by dogs of known weight, we may infer that a man weighing 140 pounds secretes daily about 10 ounces of this fluid.

One of the chief uses of the pancreatic juice in relation to digestion is to convert into sugar the amylaceous or starchy matters which have escaped the action of the saliva and have passed unchanged into the duodenum. It possesses this property in a far higher degree than the saliva, and, as might be expected in reference to this use, the pancreas is found to be much more developed in herbivorous than in carnivorous animals. Bernard, the representative of the modern school of physiology in France, claims for this fluid another important function—he believes that he has proved that it is solely by the action of this secretion that the fat is reduced to a condition in which it can be absorbed and digested: that is to say, that it is decomposed into glycerin and a fatty acid. (See FATS.) This view has, however, not been generally accepted, and it seems probable that although the change described by Bernard takes place when fat and pancreatic juice are simply mixed together in a test tube, it does not actually take place in the intestine, the acid gastric juice probably acting as an interfering agent. An attempt has lately been made by Corvisart and Meissner to prove that, like the gastric juice, this fluid can dissolve albuminous matters; but this view cannot be substantiated. Considering the large quantity of pancreatic fluid which is yielded in twenty-four hours, Schmidt, who has made the digestive juices the subject of his special study, is of opinion that the function of this fluid is not so much to promote the conversion of starch into sugar as for the purpose of diluting the chyme, and for reconverting the soda (which in the pancreas has been separated from the chlorine of the chloride of sodium, and has combined with the pancreatine) into chloride of sodium. He shows, from numerical calculations, that more than half of the chloride of sodium existing in the blood which circulates through the pancreas is broken up into hydrochloric acid and soda, of which the former is separated by the gastric glands, while the latter unites with the pancreatine. Meeting again in the duodenum, the hydrochloric acid and the soda reunite and re-form chloride of sodium, which is again absorbed and reënters the circulation. This is perhaps one of the most singular decompositions and reunions occurring in the animal body.

Of the last of the fluids poured into the intestine and coöperating in the digestive process, the *intestinal juice*, we know comparatively little. It is the aggregate secretion of the various glands which we have described as occurring in the walls of the small intestine. It is a colorless, or sometimes yellowish, ropy, viscid fluid, which is invariably alkaline. We are not aware of any special characteristic constituent in it, such as occurs in the other chylopoietic fluids. Its daily quantity is probably nine or ten ounces. It seems to unite in itself the leading properties of the pancreatic and gastric juices; that is to say, it resembles the former in converting starch into sugar, and the latter in dissolving flesh and other albuminous bodies.

We shall conclude this part of the subject with a few remarks on the chemical composition of the contents of the small intestine. On laying open the gut we usually find a semi-solid admixture of imperfectly digested and indigestible substances, and of the constituents of the digestive fluids in a more or less changed condition. The reaction of this mass varies in different parts of the canal, and in some measure with the nature of the food. Thus, the contents of the stomach always redden litmus paper, whatever kind of food has been taken; the duodenal contents are also always acid, but in a far less intense degree; in the jejunum we meet with only a faint acid reaction, which altogether disappears in the ileum; while in the cæcum, and sometimes in the lower part of the ileum, an alkaline reaction occurs. After a purely animal diet the acid reaction disappears shortly below the duodenum; while, after the sole use of vegetable food, it may sometimes be traced even to the cæcum. As a general rule the contents of the large intestine are alkaline.

In consequence of the rapid absorption that goes on along the intestinal surface, we meet with a comparatively small amount of soluble matters in these contents. Among these soluble matters we often find glucose (or grape-sugar), which seems to owe its origin to the metamorphosis of starch, and not to sugar having been present in the food; for after saccharine food has been taken we rarely meet with it in any quantity in the small intestine, its absorption taking place with great rapidity. In the alcoholic extract of these contents we can almost always find evidence of the presence of biliary constituents. In the duodenum, and for a little way beyond it, we find glycocholic and taurocholic acid; descending a little farther they rapidly diminish, till we find the products of their disintegration; while in the large intestine little more than a trace of these products can be detected. These chemical observations confirm the experiments of Schmidt, which show that nearly half the bile which is poured into the duodenum is decomposed before it reaches the middle of the small intestine.

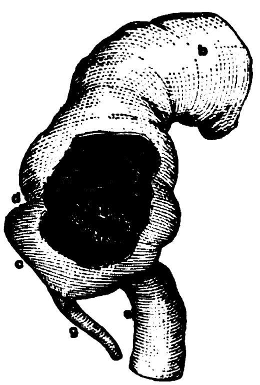


FIG. 10.

Cæcum inflated, dried, and opened to show the arrangement of the valve.

a, termination of the ileum; *b*, ascending colon; *c*, cæcum; *d*, a transverse construction projecting into the cæcum; *e f*, lips of the valve separating the small from the large intestine; *g*, the vermiform appendix of the cæcum.

(7) We have now arrived at the seventh stage of the digestive process—that of *defecation*. The line of demarcation between the small and large intestine is very obvious, and by the peculiar arrangement of the ileocæcal valve (see Fig. 10)

matters are allowed to pass forward with facility, while regurgitation is impossible. (For anatomical details regarding the large intestine, we may refer to the articles ALIMENTARY SYSTEM; CÆCUM; and COLON.) The contents of the large intestine differ very materially from those which we have been considering in the last paragraph, and constitute the fæces. They are more solid and homogeneous, and are often molded into a definite shape by the cells of the colon. The only essential change which the contents undergo in this part of their course is that they increase as they pass onward in solidity, in consequence of the absorption of fluid from them by the mucous membrane. They are propelled forward into the rectum by the vermicular action which has been already described. Here they accumulate, being prevented from escaping by the contraction of the sphincter muscle—a band of strong muscular fibres surrounding and closing the gut at its lower extremity. The act of defecation, or of expulsion of the fæces from the rectum, is effected partly by the muscular fibres of that part of the intestine which are stimulated to contraction by a certain degree of distention, and which are to a certain extent under the influence of the will, and partly by the simultaneous contractions of the abdominal muscles and of the diaphragm, which, by reducing the antero-posterior and transverse diameters of the abdominal cavity, compress the intestinal canal in such a manner as greatly to assist the expulsive action of the rectum. These forces, or some of them (for usually the detrusive action of the muscular fibres of the rectum is sufficient), overcome the passive contraction of the sphincter, and the act of defecation is the result. See FÆCES.

(8) The absorption of the chyle forms the completion of the digestive act. The coats of the intestines contain two perfectly distinct sets of vessels—one through which blood circulates, and the other containing a milky or transparent fluid, chyle, or lymph, which, after a somewhat circuitous route, is poured into the blood. We have already referred to the fact that fluids are absorbed from the stomach and intestine by the veins and capillaries of the mucous membrane; we now proceed to notice the mode in which the vessels of the second kind—the lacteals—act as absorbing agents. The lacteals are merely a portion of the great lymphatic system of the body, which will be described in a future article. (See LYMPHATICS.) They commence, as has been previously mentioned, in the villi, and possibly also in the intervening mucous membrane; and when an animal is killed while the digestive process is going on, they have, in consequence of their being distended with chyle, the peculiar white or milky appearance which procured for them their name of *vasa lactea*, from their discoverer, Asellius, in 1622. They pass in great numbers, and in a reticulated arrangement, between the layers of the mesentery, the portion of peritoneum (q.v.) which surrounds the gut and retains it in its proper position. After passing through the mesenteric glands, where their contents seem to become more highly organized, they make their way to the right side of the aorta in the lumbar region. where they finally discharge themselves into an elongated pouch, termed the *receptaculum chyli*. From this pouch the thoracic duct, containing the chyle, passes upward along the vertebral column till it reaches the level of the arch of the aorta, behind which its runs to the left side and discharges its contents into the subclavian vein, close to its origin with the internal jugular, its orifice being protected by two valves. (See CHYLE.) Chyle is in reality incipient blood, which has been formed from the food, and has been absorbed from the intestine by the lacteals. We have now traced it to its entrance into the general circulation, and it only remains for it to pass, in conjunction with the venous blood with which it is mixed, through the lungs, in order to be converted into new and perfect arterial blood, fit for the highest processes of organization. Consult Hare, *Food Factor in Disease*, 2 vols. (London, 1905); Clarke, *Indigestion* (New York, 1906).

DIGGER. A collective term, without ethnic significance, formerly applied to a number of Indian tribes in central California and the adjacent portion of Nevada, probably from their root-digging habit or from their 'dugout' dwellings. See SHOSHONEAN STOCK.

DIGGER-WASP. See MUD-WASP.

DIGGES, digz, Sir DUDLEY (1583-1639). An English diplomatist and jurist. He was born at Barham, Kent, the son of Thomas, and graduated at Oxford in 1601. In 1618 he went to Russia, and in 1620 to Holland as special ambassador, but later fell into disfavor through his independent opinions. He was author of *Rights and Privileges of the Subject* (1642) and *The Compleat Ambassador* (1655). He sat in Parliament for Tewkesbury from 1624 to 1626, and for Kent in 1628. His son DUDLEY (1613-43), a devoted royalist, was the author of *The Unlawfulnesse of Subjects Taking up Arms Against Their Soveraigne* (1643).

DIGGES, LEONARD (?—c.1571). An English mathematician. He was educated at Oxford and was the author of *Tectonicon* (1556), on measuring land, etc.; *Pantometria: A Geometrical Practise* (1571); and *A Prognostication Everlasting* (1553-56), an astrological work.

DIGGES, THOMAS (?—1595). An English mathematician, the son of Leonard. He was educated at Cambridge and entered Parliament in 1572. He constructed the alterations and fortifications of Dover Harbor, served in the Low Countries in 1593-94, and was interested in a search for the dominions of the great 'Cam of Cathaia,' in the Antarctic seas. He edited his father's *Pantometria* and a great many treatises on science and military engineering.

DIG'GORY. An awkward servant, in Goldsmith's *She Stoops to Conquer*. He begs Hardcastle not to upset his gravity during the ordeal of waiting on table by telling the story of the "Ould Grouse in the Gun-Room."

DIGHTON ROCK. A greenstone boulder near Dighton, Mass., bearing an inscription which has been much discussed by antiquarians. A drawing of the inscription was made by Dr. Danforth in 1680, another by Cotton Mather in 1712, and others in 1730, 1768, 1788, 1790, 1807, and 1812. In 1830 the Rhode Island Historical Society made a careful study of the inscription, which was interpreted by Rafn (*Antiquitates Americanæ*, Copenhagen, 1845, pp. 357-60) as Norse. The rock was reëxamined by Dr. Hoffman for the Bureau of Ethnology in 1886, and the inscription was reproduced and discussed by

Mallery in the tenth annual report of the bureau (1888-89, pp. 85, 762, and pl. liv.). The inscription is now nearly obliterated. It was probably an Indian petroglyph.

DIGIT, dĭj′ĭt (Lat. *digitus*, finger). A term applied to the ten symbols of number, 0, 1, 2, . . . 9. Thus, 305 is said to be a number of three digits. Early races were accustomed to indicate numbers by their fingers, and finger-reckoning (see Finger Symbolism) played a great part in mediæval computation; hence the name digit. Originally the term was applied more generally to the nine numbers, 1, 2, . . . 9, and it has also been applied to the characters themselves. The term occurs in a work attributed to Boëthius, and was common throughout the Middle Ages, the numbers 10, 20, . . . 90 being called 'articles,' and combinations of articles and digits being called 'composites.' Astronomers use the term digit to signify a twelfth part of the diameter of the sun or moon, and speak of an eclipse of seven digits, meaning that seven-twelfths of the diameter is covered. See Numerals.

DIGITALIN, dĭj′ĭ-tā′lĭn (from Neo-Lat. *digitalis*). One of the glucosides found in the leaves of the foxglove (*Digitalis purpurea*), growing in Europe. It is a crystalline substance sparingly soluble in water and in ether, and constitutes one of the active principles of digitalis. The commercial *Homolle's Digitalin*, or *Quévenne's Digitalin*, consists largely of digitalin and is used in France as a substitute for digitalis leaves. The substance known as *Nativelle's Digitalin* consists principally of *digitoxin*, another poisonous glucoside.

DIGITALIS, dĭj′ĭ-tā′lĭs (Lat. *digitalis*, pertaining to the finger, from *digitus*, finger; in allusion to the shape of flowers). A genus of plants of the natural order Scrophulariaceæ (Linné), tribe Digitaleæ, natives chiefly of the south of Europe and western and middle Asia, characterized by a five-cleft calyx, campanulate, ventricose corolla, upper lip reflexed, capsule two-celled, flowers in showy racemes. One, the common foxglove (*Digitalis purpurea*), is a native of Great Britain, and is very abundant in some parts of the country, its large purple flowers often giving a gay appearance to dry banks and steep hills. The purple-flowered, white-flowered, and yellow-flowered varieties are cultivated in America. Digitalis purpurea is much valued in medicine. The leaves of the second year's growth are the parts used. They are narcotic and poisonous. The leaves have a disagreeable smell when fresh and a bitter, nauseous taste, and are violently emetic and cathartic; but when dried and administered in small doses they are diuretic, and therefore sometimes useful in dropsy; and are still more valuable on account of their power over the action of the heart and the circulation of the blood, and are used in some diseases of the heart, in the second stage of pneumonia, in cardiac weakness from collapse, and as the antidote in aconite poisoning. Digitalis owes its efficiency to various alkaloids and other substances, some crystalline, known as digitalin, digitalein, digitoxin, digitonin, and digitin. Digitoxin, probably, is the actively poisonous agent. Digitalin fulfills all the offices of digitalis in influencing the heart and the circulatory system, and is less dangerous. But the drug should never be given except by a physician, who can understand in which cases it is applicable. In some cases of heart disease it is fatal. In some cases it has a cumulative action with fatal results. The official preparations of digitalis are a tincture, an infusion, a fluid extract, an abstract, a solid extract, and the powdered leaves.

FOXGLOVE.

DIGITIGRADA, dĭj′ĭ-tĭ-grā′dȧ (Neo-Lat. nom. pl., from Lat. *digitus*, finger, toe + *gradi*, to walk). In the zoölogical system of Cuvier, one of the tribes of Carnivora, distinguished by walking on the toes alone, the heel not touching the ground. The word is no longer used as the name of a group, but in the adjective form describes those animals which walk wholly on the toes as opposed to 'plantigrade' or walking on the whole sole of the foot. Most mammals are more or less completely digitigrade.

DIGITORIUM, dĭj′ĭ-tō′rĭ-ŭm. See Pianoforte.

DIGNE, dē′ny' (Lat. *Dinia*, Gall. *din*, fort). The capital of the Department of Basses-Alpes, France, on the Bléone, 60 miles northeast of Marseilles (Map: France, N 7). It occupies a picturesque situation upon a mountain slope, and is encircled by walls, but its streets are narrow, crooked, and steep. It contains a cathedral, a handsome modern lycée, and a public library. Among its chief manufactures are articles of leather, and it has a trade in dried fruits, honey, wax, woolen and linen cloth, kid-skins, etc. In the neighborhood there are several hot saline springs, temperature 104° F. Of Dinia, which is mentioned by Pliny, nothing remains. It is known that it embraced Christianity at an early period, and has given title to a bishop since the year 340. In 1629 a plague reduced the population of Digne from 10,000 to 1500. Population, in 1891, 7261; in 1901, 7238.

DIGNITY. In English law, a title of honor or nobility. Such titles are regarded as a species of property, and are classified by Blackstone as incorporeal hereditaments, which, on the death of the owner, pass, like the rest of his real estate, to his heir and not to his personal representative. Like lands, also, dignities are held of the Crown, to which they revert by escheat on the failure of heirs, whereupon they may be granted, like escheated lands, to another. The English law recognizes also a species of inferior dignity, as knight, sergeant-at-law, and esquire, which are not generally inheritable. A superior dignity, or title of nobility, may be employed in legal proceedings without the surname of the bearer, and in early English law the omission of the title or 'addition' of a party in a suit was sufficient ground for the abatement of the action. See Nobility; Titles of Honor.

DIGNITY AND IMPUDENCE. A well-known painting by Landseer, in the National Gallery, London, representing two dogs, a grave hound and an impertinent terrier.

DI'GONEU'TISM. This phenomenon has been observed in butterflies by Scudder. It is, stated briefly, the result of summer dormancy in the larva or of prolonged life in the pupa. Owing to this prolongation of life in their preparatory stages, all the butterflies of one and the same brood do not appear in the same season, but a portion of the brood flies the next year. Thus the butterflies belated one year fly and interbreed with their nephews and nieces instead of their brothers and sisters. This is advantageous to the species, since it prevents too close in-and-in breeding.

DIHEDRAL ANGLE. See Angle.

DIJKSTRA, dīk'strȧ, Waling (1821—). A Frisian poet, born at Vrouwen Parish (Province of Friesland). By his poetic works, in which he shows some similarity to Fritz Reuter, he has greatly contributed to the extension of the Frisian language and literature. These include: *Doaitse mei de noardsce balke* (3d ed. 1875); *De silveren rinkelbel* (3d ed. 1887); *In doaze fol alde snypsnaren* (in collaboration with van der Meulen, 2d ed. 1882); *Friske winterjounenocht* (5 vols., 1861-76). Perhaps his greatest work is *Uit Frieslands volksleven van vroeger en later* (Leeuwarden, 1892).

DIJON, dē'zhôɴ' (Lat. *Castrum Divionense*). A town and seat of a bishopric, capital of the Department of Côte d'Or, France, formerly capital of the old Duchy of Burgundy (Map: France, L 4). Dijon occupies a delightful situation in a fertile plain on the right bank of the Ouche, and at the base of the vine-clad hills which produce the famous Burgundy wines, 211 miles southeast of Paris by rail. The environs are exceedingly beautiful. Dijon is surrounded by old walls, originally having five gates; the ramparts, planted with trees, have been converted into fine boulevards and promenades. The town is for the most part well and regularly built of freestone, and the streets are spacious and clean. Among the public buildings, which are numerous and imposing, the chief are the cathedral, a massive Gothic structure, dating from the thirteenth century, with a tall wooden spire, above 300 feet high; the Church of Notre Dame, a noble specimen of Gothic architecture; the Church of Saint Michel, with a splendid Renaissance front; the theatre, a handsome building with a fine Corinthian portico; and the palace of the dukes of Burgundy, now used as the town hall. This last-mentioned edifice is exceedingly interesting, and, modernized as it is on the exterior, its internal decorations still survive in their pristine beauty. The museum located in it is rich in monuments of the Middle Ages. Dijon is the seat of a university with three faculties—law, science, and letters—and a library with over 55,000 volumes, and possesses, in addition, a royal college, a theological seminary, a botanic garden, and an academy of art. The manufactures consist of woolen cloth, blankets, hosiery, leather, vinegar, chemical products, etc.; and there are salt refineries, distilleries, and breweries, but the town is mainly dependent on its trade in the wines of Burgundy. Population, in 1901, 71,326. Dijon dates from Roman times. It came into the possession of the Burgundians in the fifth century, and from them passed to the Franks. In the ninth century it was ruled by counts of its own, under the suzerainty of the bishops of Langres. In the eleventh century it was united to the Duchy of Burgundy, of which it became the capital, and the usual residence of the dukes, who rebuilt and greatly enlarged and improved it. On the death of Charles the Bold, 1477, it was annexed to the Crown of France by Louis XI. Dijon is the birthplace of Bossuet, the elder Crébillon, and Jouffroy, the sculptor.

DIKE, or **DYKE** (AS. *dīc*, Icel. *dīk*, MHG. *tīch*, Ger. *Teich*, pool; probably connected ultimately with Gk. *τεῖχος*, *teichos*, wall). In geology, a relatively thin body of igneous rock occurring between the separated walls of a fissure. It differs from vein, which it resembles in form, in having originated by the intrusion and consolidation of molten material, and not by the deposition of minerals from solution. Dikes are usually inclined at considerable angles from the horizontal, and, when the adjacent rock has decayed, they project above the surface like walls of masonry. They vary in width from a few inches to hundreds of feet, the larger dikes sometimes extending a distance of many miles; they reach downward to unknown depths. Proof of their igneous origin is found in the great changes which the strata forming their walls have suffered by the intense heat. Limestone in contact with dikes is changed to crystalline marble; shale is hardened to slate, or by the development of new minerals becomes schist; and bituminous coal assumes the character of anthracite. While of wide occurrence, dikes are especially frequent in regions of crustal folding and volcanic disturbance. They are often found traversing the sides of volcanoes, where they originate during eruptions by fissuring of the cone and filling of the cracks with lava. The consolidation of igneous rocks in the form of dikes develops peculiar features of structure, and this fact has been used by some authorities as the basis of a rock class known as 'dike rocks.' See Geology; Igneous Rocks; Volcano.

DIKE. An embankment of earth, most commonly one used to reclaim or protect lands subject to flooding or formed in land-drainage operations. The term is sometimes applied to low earth dams, generally such as are auxiliary to the main dam, forming an artificial reservoir by closing minor outlets from the natural basin. See Dams; Drainage; Levees.

DI′KE (Gk. Δίκη). The embodiment of justice in Greek mythology. She is the daughter of Zeus and Themis, and, with her sisters, Eunomia (Order) and Irene (Peace), is reckoned among the Horæ. Like the Erinnyes, the avengers of wrong, she is, unlike them, also the rewarder of virtue.

DIKE, dīk, Samuel Warren (1839—). An American Congregational clergyman, prominent as an agitator for reform in the laws of divorce. He was born at Thompson, Conn. He graduated at Williams College in 1863 and at Andover Theological Seminary in 1866. In 1881 he became corresponding secretary of the Divorce Reform League (now called the National League for the Protection of the Family), which he organized. His writings are mostly in exposition and defense of the principles of the league.

DIKEL′OCEPH′ALUS (Neo-Lat., from Gk. δίκελλα, *dikella*, mattock + κεφαλή, *kephalē*, head). A genus of Upper Cambrian trilobites of the family Olenidæ. The carapace is broad and flat, the head broadly lunate, eyes elongate reniform, glabella short, thorax broad and flat, with nine segments and low axis, and pygidium large, expanded, and flat, with a sharp triangular spine at each posterior lateral corner. The best-known species, Dikelocephalus Minnesotensis, with a length of three to eight inches, is very common in certain yellow shales of the Upper Cambrian in Wisconsin and Minnesota. A number of other species from the Cambrian and Lower Ordovician of Europe and North America have been incorrectly placed in this genus, which is considered generally as the index fossil of the Upper Cambrian, or Potsdam horizon. See Olenus; Trilobite.

DIKOA, dė-kō′ȧ. A fortified town of the old kingdom of Bornu, in Central Africa, now included in the German colony of Kamerun (Map: Africa, F 3). It is situated about 25 miles south of Lake Chad. Its population is estimated at about 50,000.

DILAPIDATION (Lat. *dilapidatio*, from *dilapidare*, to waste, from Lat. *di-*, apart + *lapidare*, to throw stones, from *lapis*, stone). In the English law this arises where a rector, vicar, or other incumbent of an office of the established Church of England destroys, pulls down, or allows to fall into decay for want of repair, his residence or any other buildings belonging to his spiritual living; or commits or allows any injury or waste upon the lands, woods, or other inheritance of the Church. The liability is solely for preservation of the property, and not for anything in the way of ornament. See Benefice; Repairs; Waste.

DILE′MI. The name of a Persian dynasty. See Samani and Dilemi.

DILEMMA (Lat. *dilemma*, from Gk. δίλημμα, conclusion from two propositions, from δι-, *di-*, double + λῆμμα, *lemma*, proposition, from λαμβάνειν, *lambanein*, to take). A true dilemma is defined by Whately as "a conditional syllogism with two or more antecedents in the major, and a disjunctive minor." One form of it is represented in the following scheme: If A is B, C is D, and if F is G, C is D; but either A is B or F is G, hence C is D. There being two mutually exclusive propositions in the minor premise, a person must admit one or the other, and is then caught between the 'two horns of the dilemma.' See Logic.

DILETTANTE, dĭl′ĕt-tăn′tė *or* dē′lĕt-tän′tȧ (It., pres. part. of *dilettare*, to delight). A term in its original sense synonymous with an *amateur*, or lover of the fine arts. It has, however, come into use as suggesting somewhat the trifler, the dabbler in any or all of those arts which, if seriously pursued, make for civilization and true culture. The dilettante, however, may serve a good purpose, and often does, by interesting himself in the conservation of objects of art. See Dilettante Society.

DILETTANTI SOCIETY. A body of noblemen and gentlemen by whose exertions the study of antique art in England has been largely promoted. The society was founded in 1734, and held its meetings at the Thatched House Tavern in Saint James Street. It was in its beginnings simply an amateur club, its object being to combine social and friendly intercourse with the cultivation of artistic knowledge and the gratification of artistic tastes. But its funds having accumulated to a large amount, its members resolved, in 1764, to fit out an expedition for the purpose of collecting details and drawings of the most remarkable artistic monuments of antiquity. The persons selected for carrying out this important undertaking were Mr. Chandler, of Magdalen College, Oxford, the editor of the *Marmora Oxoniensis;* Mr. Revett and Mr. Stewart, the authors of the magnificent work on Athenian antiquities; and Mr. Pars, a talented young artist. Having spent two years in Greece, they returned in 1766, bringing with them the materials for the two splendid volumes on the antiquities of Ionia, which were published at the expense of the society. Architecture had been the first object of their inquiries, but their attention was now turned to sculpture, which was then at the lowest ebb in England. A series of the finest antique statues, bas-reliefs, and busts was selected and engraved with the greatest care. This work appeared in 1809, with dissertations by Payne Knight. In 1811 a second architectural exploring party was dispatched by the society to Asia Minor, consisting of Mr. (afterwards Sir William) Gell, Mr. Bedford, and Mr. Gandy. Two volumes were issued, one in 1817 entitled *The Unedited Antiquities of Attica,* and a second on *Antique Sculpture* in 1835. For these spirited exertions in their behalf, the public have been indebted to a club of some sixty private gentlemen. In 1777 Sir Joshua Reynolds, who was at that time painter to the Dilettante Society, began his famous portraits of the members, which consist of two groups of seven persons each. For further particulars consult Cast, *History of the Society of Dilettanti,* ed. Colvin (London, 1898).

DILIGENCE (Fr., from Lat. *diligentia*, attentiveness, from *diligere*, to love, choose, from *di-*, apart + *legere*, to choose). A name used in France for a public conveyance resembling a stage-coach. It was a huge, strong-built vehicle, with 4 broad wheels, weighing, with its load, about 5 tons, and was drawn by 4 stout horses, at the rate of about 6 miles an hour. It consisted of 3 chief compartments; the front, called the *coupé*, for 3 persons; the second, called the *intérieur*, for 6 persons; and, lastly, the *rotonde*, entered from behind, for 6 persons. Aloft, in front, was the *banquette*, where the *conducteur* was seated; and behind this, underneath a thick leather covering, passengers were sometimes huddled among luggage and goods, with little regard to their comfort. All the places in the body of the vehicle were numbered, and assigned in the order of booking. Usually an effort was made to be booked early, in order to secure corner places. In booking, it was customary to pay only a portion of the fare, called *arrhes* (earnest money), the remainder being paid at the end of the journey. The driver being concerned only with the horses, the entire management of the vehicle, including the charge of the drag or break, devolved on the *conducteur*, a personage dressed in a blue cloth jacket and cap, and having a badge on his breast indicative of his dignity. The system of diligences has become obsolete since the development of railways, but the memory of the diligence will long survive in literature.

DILKE, dĭlk, CHARLES WENTWORTH (1789-1864). An English critic and antiquary. He graduated at Cambridge, was for many years an official in the navy pay-office, and from 1830 to 1846 edited the *Athenæum*, of which he had in the former year become proprietor. In 1846-49 he managed the *Daily News*. He was a friend of Keats, Hood, Leigh Hunt, Barry Cornwall, and Lamb, and between 1847 and 1864 wrote for the *Athenæum* a number of valuable literary essays, collected as *Papers of a Critic* (2 vols., 1875).

DILKE, Sir CHARLES WENTWORTH (1810-69). An English promoter and politician, born in London and educated at Cambridge. He was a zealous promoter of the great International Exhibition of 1851; and was one of the English commissioners of the New York Industrial Exhibition of 1853. He was also one of the five royal commissioners for the exhibition of 1862, and was shortly afterwards knighted. In 1865 he was a member of Parliament, and in 1869 representative of England at the Saint Petersburg Horticultural Exhibition.

DILKE, Sir CHARLES WENTWORTH (1843—). An English politician and author, born at Chelsea, the grandson of Charles Wentworth Dilke (q.v.). He graduated at Cambridge in 1866, traveled extensively in the United States, Canada, and the British countries in the East; and embodied his observations in *Greater Britain: A Record of Travel in English-Speaking Countries During 1866-67* (1868). He represented Chelsea in Parliament from 1868 to 1886, was Under-Secretary of State for Foreign Affairs from 1880 to 1882, and was president of the Local Government Board from 1882 to 1885. Always a radical in politics, he was fiercely attacked in the seventies because of his avowed republicanism. Among the reform measures carried by him was the one securing the municipal franchise for women. In 1884 he was prominent as chairman of the Royal Commission on the Housing of the Working Classes. In February, 1886, a Mr. Crawford secured a divorce from his wife, naming Sir Charles Dilke as co-respondent; the case was spoken of and known as the Crawford Scandal. Pending the trial and after it was known that Sir Charles was implicated, he was elected member of Parliament for Chelsea, it being understood that he would resign if the final outcome of the trial seemed to his constituents to warrant it. He retired from public life, but reëntered it in 1892, since which time he has sat in Parliament for the Forest of Dean, exercising much of his old prestige as a leader but remaining out of office. Sir Charles Dilke succeeded his father and grandfather as *proprietor of the Athenæum*, and became the owner of *Notes and Queries*. Besides the works already mentioned, he published *The Present Position of European Politics* (1887); *Problems of Greater Britain* (1890), and *The British Empire* (1898).

DILKE, Lady EMILIA FRANCES STRONG (1840-1904). An English author, born at Ilfracombe. She became a contributor to the *Saturday Review* in 1864, and subsequently was for many years fine-art critic of the *Academy*. In addition to numerous articles in periodicals, she published *The Renaissance of Art in France* (1879), a biography of *Lord Leighton* (1881, in Dumas's "Modern Artists Series"); *Art in the Modern State* (1884); *French Painters of the Eighteenth Century* (1899); and *French Architects and Sculptors of the Eighteenth Century* (1900); *French Engravers and Draughtsmen of the XVIIIth Century* (1902); *Book of the Spiritual Life*, with memoir of the author (1905).

DILL (AS. *dile*, OHG. *tilli*, Ger. *Dill*, from Dutch *dille;* origin obscure), *Anethum*. A genus of plants of the natural order Umbelliferæ, having compound umbels without general or partial involucres. Dill (*Anethum* or *Peucedanum graveolens*) is an annual or biennial plant, which grows wild in grain-fields in the East and in the countries around the Mediterranean. It is quite hardy in Great Britain, and is cultivated to some extent in the United States. It has from a very early period been in general cultivation as an aromatic, stimulant, and carminative. It has a stem one to four feet high, bearing at top a flat umbel of ten to thirty rays; the leaves much divided, and the final segments thread-like. It has strong, peculiar aromatic smell and taste; the leaves and fruits are extensively used for flavoring pickles, sauces, etc. The fruit (dill-seed) is used in medicine, chiefly for relief of flatulence in infants, and is administered in the form of dill water in the preparation of which oil of dill is employed—a pale-yellow essential oil, on which the properties of the plant depend, and which is obtained by distillation. Sowa dill (*Anethum sowa*), now considered as identical with the preceding, is a native of Bengal, and is much cultivated in the East Indies for its fruit, which is variously used in medicine and flavoring. It is a common ingredient in curries. The plant much resembles common dill, but its flavor is stronger.

DILLE′NIUS, or **DIL′LEN**, JOHANN JAKOB (1687-1747). A German-English botanist. He was born at Darmstadt, Germany. After holding a professorship at the University of Giessen he went to England (1721), and was in charge of the celebrated Sherard Botanical Gardens at Eltham for several years. In 1728 he was appointed professor of botany at Oxford, where he remained until his death. His work on mosses, entitled *Historia Muscorum in qua circiter Sexcentæ Species Veteres et Novæ ad sua Genera Relatæ Describuntur* (1741; reprinted, 1811), was long accepted as the standard authority on the subject. Consult Schilling, *Johann Jakob Dillenius* (Hamburg, 1888).

DILLENBURG, dĭl′len-bo͞orG. The capital of the circle of Dill, Hesse-Nassau, Prussia, picturesquely situated on the Dill, 21 miles southwest of Marburg. It has interesting associations with William of Orange, the liberator of the Netherlands, in the Wilhelmsthurm, 130 feet high, occupying the site of Dillenburg Castle, in which he was born in 1533. Iron-mining is the chief industry. A mining school is one of the educational institutions. Pop., in 1900, 4470.

DILLER, JOSEPH SILAS (1850—). An American geologist, born at Plainfield, Pa. He studied at Harvard University, and at Heidelberg, Germany. In 1881 he served as geologist to the Assos Expedition. In 1883 he was appointed to the staff of the U. S. Geological Survey. He wrote numerous papers and monographs chiefly relating to the Pacific coast region.

DILLINGEN, dĭl′lĭng-*en*. A town of Bavaria, on the Danube, 24 miles northwest of Augsburg. Its principal buildings are the palace, the royal gymnasium and Latin school, a Capuchin monastery, a Franciscan nunnery, a deaf and dumb asylum, and several hospitals. The university, which was founded in 1540, and was one of the chief seats of the Jesuits, was suppressed in 1804. There are manufactures of cutlery and twine. Population, in 1890, 5775; in 1900, 6077. In the Middle Ages the town was the seat of the counts of Dillingen, and from 1286 until 1803, when it came into the possession of Bavaria, it belonged to and was the residence of the bishops of Augsburg.

DILLINGHAM, WILLIAM PAUL (1843—). An American lawyer and politician, born at Waterbury, Vt. He was admitted to the bar in 1867, was Secretary of Civil and Military Affairs of Vermont from 1874 to 1876, a member of the Lower House of the Vermont Legislature in 1876 and 1884, and of the Senate in 1878 and 1880. In 1888-90 he was Governor of the State, and in 1900 was elected to the United States Senate to take the seat of Justin S. Morrill (q.v.), deceased, and was reëlected in 1902.

DILLMANN, dĭl′mȧn, CHRISTIAN FRIEDRICH AUGUST (1823-94). A German Orientalist and theologian. He was born at Illingen, Württemberg, and educated at Tübingen, where, in 1852, he became lecturer. In 1854 he became professor of Oriental languages at Kiel, and in 1864 accepted a call to a professorship of Old Testament exegesis at Giessen. He succeeded Hengstenberg as professor of Old Testament exegesis at the University of Berlin in 1869, and in 1877 was elected a member of the Royal Academy of Sciences. He is noted for researches in the Ethiopic language, of which he published a grammar (1857) and a dictionary (1865). His other publications include a commentary on Exodus and Leviticus (3 ed. 1897) and one on Genesis (6th ed. 1892).

DIL′LON, JOHN (1851—). An Irish politician and agitator. He was born in Dublin, the son of John Blake Dillon (1816-66), who was a prominent member of the Young Ireland Party. Dillon was educated at the Catholic University of Dublin and the Royal College of Surgeons of Ireland. He early identified himself with the Parnellite movement, and in 1880 was returned for Tipperary. In Parliament he soon became prominent for the violence of his language, while his connection with the 'Plan of Campaign', inciting the Irish tenants to lawlessness, led to his imprisonment in 1888 and 1891. From 1883 to 1885 he suffered from ill health: but in the latter year he was elected for East Mayo, and was reëlected in 1892, 1895, 1900, and 1906. He succeeded Justin McCarthy as chairman of the Irish Nationalist Party in 1896, and held this position until 1899. He visited the United States on several occasions between 1882 and 1894.

DILLON, JOHN FORREST (1831—). An American lawyer. He was born at Northampton, Fulton County, N. Y., and early in life settled in Iowa, where he successively became State Prosecuting Attorney (1852-58), judge of the Supreme Court of Iowa (1863-69), and judge of the United States Circuit Court, Eighth Judicial District (1869-79). From 1879 to 1882 he was professor of real estate and equity jurisprudence at Columbia Law School. He became prominently known as a railroad lawyer, and was associated as general or consulting counsel with the Manhattan Elevated and Union Pacific railroad companies, and with the Western Union Telegraph Company. His works include: *Municipal Corporations; Removal of Causes from State to Federal Courts; Laws and Jurisprudence of England and America; John Marshall*, 3 vols. (1903).

DILOLO, dė-lō′lō, LAKE. A small lake in Portuguese West Africa, near the southern boundary of the Congo Free State, situated in latitude 11° 30′ S., longitude 22° 30′ E. Its altitude is about 4700 feet. It lies on the watershed between the river systems of the Congo and the Zambezi, with both of which it may be connected. Lake Dilolo was discovered by Livingstone in the beginning of 1854. It abounds in hippopotamuses and fish.

DILTHEY, dėl′tī, WILHELM (1834—). A German philosopher. He was born at Biebrich, and was educated at Heidelberg and Berlin. He occupied the chairs of philosophy at Basel in 1866, Kiel in 1868, Breslau in 1871, and Berlin in 1882. In *Einleitung in die Geisteswissenschaften* (1883), he endeavors to furnish a rational basis for the sociological and historical sciences, by eliminating metaphysics and substituting psychology as a primary factor. He wrote also *Das Erlebnis und die Dichtung* (1906).

DIL′UENTS (from Lat. *diluere*, to wash away, from *di-*, apart + *luere*, to wash). Medicines whose purpose is to dilute the blood and increase the quantity of the excretions generally. The simplest and best of diluents is pure water; but all watery fluids, such as lemonade, soda-water, beer, infusions, tea, etc., may be regarded as coming under this designation.

DILU′VIUM (Lat. flood, from *diluere*, to wash away). A name formerly given by geologists to those strata which they believed to have been formed by the deluge, and more particularly to the boulder clay. When the adjective—diluvial—is employed by modern writers, it is to characterize those accumulations of gravel or angular stones formed during the Pleistocene period. The term is little used by modern writers, except perhaps in Germany.

DI'MAN, Jeremiah Lewis, D.D. (1831-81). An American Congregational theologian. He was born in Bristol, R. I., and died in Providence, where he had been professor of history and political economy in Brown University (his alma mater) since 1864. He was an able preacher and orator, and is remembered by his posthumous publications, *The Theistic Argument* (1881), and *Orations and Essays* (1881). For his biography, consult Caroline Hazard (Boston, 1887).

DIMANCHE, dē'mänsh', Monsieur. A merchant in Molière's *Don Juan*, who unsuccessfully attempts to collect his bills. The term is in use in France as the synonym for a dun.

DIME (OF. *disme*, Lat. *decimus*, tenth, from *decem*, ten). In the United States, a silver coin whose value is ten cents—that is, one-tenth of a dollar.

DIMENSION (Lat. *dimensio*, from *dimetire*, to measure off, from *di-*, apart + *metiri*, to measure). In geometry, a line, whether straight or curved, has one dimension, viz. length; a plane surface has two, length and breadth; and a solid has three, length, breadth, and thickness. In algebra, the term dimension is applied in much the same sense as degree, to express the number of literal factors contained in a product. Thus x^2, xy, $2ab$ are said to be of two dimensions; x^3, x^2y, $\frac{a^2bc}{a}$ of three; and so on. In physical measurements the power to which the unit (q.v.) of measure enters, determines the dimension of the expression. The form of any material body may be described in terms of at least three dimensions, hence the space in which these forms or figures exist is usually regarded as tri-dimensional. However, the possibility of the existence of a space having more than three dimensions has been discussed. The possibility of such space is conceivable and such an hypothesis is of service to the mathematician in explaining analytic phenomena. Since points, lines, and surfaces, in general, generate by their motion lines, surfaces, and solids, respectively, it may be inferred that some movement of a figure of three dimensions can generate a figure of four dimensions. Analytically it is only necessary to imagine four parameters or coördinates belonging to each point of four-dimensional space, or five in five-dimensional space, and so on, in order to develop a system of analysis as logical in itself as that of only three dimensions. Figures to represent some features of four-dimensional bodies have been imagined. See Chasles; Characteristic; and Geometry.

DIMENSIONS. All physical quantities, such as force, energy, electric intensity, magnetic poles, etc., admit of mathematical expression in terms of the elementary ideas of physics. Thus, all mechanical quantities can be expressed in terms of mass, length, and duration of time. All electrical and magnetic quantities can be expressed in terms of mass, length, duration of time, and the 'inductivity' of matter for electric or magnetic forces. (See Electricity.) Thus, velocity is defined as the limiting value of Δx to Δt where Δx is the distance traversed in the time Δt; consequently velocity involves the idea of a number of units of length divided by a number of time-units: its 'dimensions' are said to be $\frac{L}{T}$ or LT^{-1}. If, therefore, on any system of units, e.g. the C.G.S. system (q.v.), the numerical value of a certain velocity is V, its value on a system of units in which the unit of length is ten times as large as in the former system would be V/10. Similarly, acceleration or the rate of change of velocity with reference to the time has the dimensions $\left(\frac{L}{T}\right) \div T$ or LT^{-2}. Force is measured by the product of acceleration and mass; its dimensions are therefore MLT^{-2}.

In the following table are given the dimensions of various mechanical quantities:

Acceleration	LT^{-2}
Force	MLT^{-2}
Pressure	$ML^{-1}T^{-2}$
Work Energy	ML^2T^{-2}
Moment of force	ML^2T^{-2}

If K and μ are written for the dimensions of electric and magnetic inductivity, the dimensions of electric and magnetic quantities have the following values. In the first column are given the electro-static system of units; in the second, the electro-magnetic. (See Electricity.)

Electric quantity	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}K^{\frac{1}{2}}$	or $L^{\frac{1}{2}}M^{\frac{1}{2}}\mu^{-\frac{1}{2}}$
Electric current	$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}K^{\frac{1}{2}}$	or $L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}\mu^{\frac{1}{2}}$
Magnetic pole		$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-1}\mu^{\frac{1}{2}}$
Electric resistance		$LT^{-1}\mu$
Electro-motive force	$L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}K^{-\frac{1}{2}}$	or $L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}\mu^{\frac{1}{2}}$
Electric capacity	LK	$L^{-1}T^2\mu^{-1}$

The dimensions of any one physical quantity, however expressed, must be identical; and therefore, choosing electric current

$$L^{\frac{3}{2}}M^{\frac{1}{2}}T^{-2}K^{\frac{1}{2}} = L^{\frac{1}{2}}M^{\frac{1}{2}}T^{-1}\mu^{-\frac{1}{2}} \text{ or } LT^{-1} = \mu^{-\frac{1}{2}}K^{-\frac{1}{2}}. \text{ Hence } \mu K = L^{-\frac{1}{2}}T^{-\frac{1}{2}}.$$

This means that, although the dimensions of neither electrical nor magnetic inductivity are known in terms of length, mass, or time, the product of the two has the dimensions $L^{-\frac{1}{2}}T^{\frac{1}{2}}$; i.e. the same dimensions as the square root of the reciprocal of a velocity.

It should be noted that work and moment of force have the same dimensions; but there is a difference in this respect, in work the element of distance is in the direction of the force, while in moment of force the element of distance is at right angles to the direction of the force. This might be indicated by calling X and Y the dimensions of length in directions at right angles to each other; in which case force has the dimensions MXT^{-2}; work, MX^2T^{-2}; moment of force, $MXYT^{-2}$.

In any equation connecting physical quantities, it is evident that the dimensions of the quantities on the two sides of the equation must be identical; for a mass cannot equal a length, etc. This fact is often useful either in verifying general conclusions or in predicating the connection between various quantities. The subject of dimensions is thoroughly treated in Daniel's *Text-Book of the Principles of Physics* (London, 1894); Maxwell, *Heat* (London, 1891); Everett, *The C. G. S. System* (London, 1902).

DIMID'IA'TION (Lat. *dimidiatio*, a halving, from *dimidiare*, to halve, from *dimidius*, half, from *di-*, apart + *medius*, middle). In heraldry, a mode of marshaling (q.v.) arms followed chiefly before quartering and impaling came into use, and retained to some extent in Continental heraldry. It consists in cutting two coats-of-arms in half by a vertical line, and uniting the dexter half of the one to the sinister half of the other.

DIMIN'UEN'DO (It., diminishing). A term in music, meaning to diminish in loudness. Diminuendo can be applied to a single note, when it is a long note, as well as to a passage of many notes; but the diminuendo on a single note can be executed only on wind instruments, or on stringed instruments played with a bow. Diminuendo is so nearly of the same meaning as decrescendo that it is frequently marked with the same sign, thus: >

DIMINUTION (Lat. *diminutio*, *deminutio*, from *deminuere*, to lessen, from *de*, down + *minuere*, to make small, from *minor*, less). In music, the repetition of a theme in such a manner that each note of the original theme is reduced to one-half or one-quarter of its original value. Diminution occurs most frequently in the stretta of the fugue, but also in the free style of writing. For diminution of intervals, see INTERVAL.

DIMINUTIONS. A word indiscriminately used in heraldry for differences, marks of cadency, and brisures.

DIMINUTIVE (Fr. *diminutif*, ML. *diminutivus*, from Lat. *deminutivus*, diminutive, from *deminutus*, p.p. of *deminuere*, to lessen). A form of words, chiefly of substantives, in which the primitive notion has become lessened or diminished, as *hillock* = *a little hill.* With littleness is associated the idea of neatness, and also of needing protection; hence diminutives are used as terms of endearment; sometimes they imply contempt. There is perhaps no language without diminutives; and the most common method of formation is by the addition of a syllable. The commonest of the English diminutive affixes are *ock*, *kin*, *el*, or *le*, which are of Germanic origin, and *et* or *let*, of classical origin; as in *bullock*, *lambkin*, *kernel* (little corn), *lancet*. The termination *ling*, or rather *ing*, was originally patronymic.

Diminutives often occur in proper names; *Perkin* is the diminutive of *Peter*, *Jenkin* of *John.* These have settled down into permanent and distinct names; but in the language of fondness and familiarity, *Charles* becomes *Charley; John*, *Johnny;* etc. In Lowland Scotch, this form of diminutive is not confined to proper names, but is applied to every object, animate or inanimate —*laddie*, *horsie*, *wifie*, *firie.* Sometimes one diminutive affix is joined to another, as *lassock*, *lassockie;* and in expressions like "*A wee, wee bit horsikie,*" the diminution is carried to the fifth degree. It is principally in the mouths of the people and in friendly familiarity that these diminutive forms are most common. Italian is remarkable in this respect, especially the Tuscan dialect. *Casa*, house, becomes *casarella*, little house, and *casarellina*, pretty little house; from *fratello*, brother, which is itself a diminutive of the Latin *frater*, children, it is said, may be heard forming such fond names as *fratellinuccieltinetto.* The affection of the Germans expresses itself largely in this form; *vater*, father, becomes *väterchen*, dear father; and even the pronoun *du*, thou, is made into *duchen* and *duli.* Some of the Low German dialects are even richer than German in diminutives.

Diminutives are not confined to nouns; *whitish* is the diminutive of the adjective *white;* and *tipple*, *scribble*, *dandle*, are examples of diminutive verbs. Opposed to diminutives are augmentatives, which abound in the Romanic languages, especially in Italian and Spanish, and express not only largeness, but coarseness and vulgarity: *casotta*, in Italian, a large house; *cavalluccio*, a worthless house; *hombracho*, in Spanish (from *hombre*), a fat, robust man.

DIMITRI RUDIN, dē'mē'trē' rōō'dēn'. A novel by Turgenieff (1855). It deals with the misfortunes of a Russian would-be cosmopolite.

DIMITY (ML. *dimitum*, Gk. *δίμιτος*, *dimitos*, dimity, from *δι-*, *di-*, double + *μίτος*. *mitos*, thread). The name originally applied to a stout figured cotton fabric, used chiefly for bed-hangings. The figure or stripe is raised on one side and depressed on the other, so that the two faces present reversed patterns. It is commonly white, or of a single color; but variegated dimities are made, the pattern and the ground being of different colors. The name is also applied to a fine cotton fabric for dresses, which sometimes resembles the coarser kind in that the figure or stripe is reversible, being raised on one side where it is depressed on the other.

DIM'MESDALE, ARTHUR. A powerfully drawn character in Hawthorne's *Scarlet Letter.* He is a clergyman of intense sensitiveness, living a blameless life, but tormented by the consciousness of his concealed sin formerly committed with Hester Prynne.

DIMOCK, dĭm'ok, or **DYMOKE.** A Lincolnshire family which has held the feudal title, 'Champion of England,' since 1377. See CHAMPION.

DIMORPHISM. (1) In plants. See LEAF; POLLINATION. (2) In animals. See POLYMORPHISM; EVOLUTION.

DIMORPH'ODON (Neo-Lat., from Gk. *δίμορφος*, *dimorphos*, two-formed + *ὀδών* *odōn*, Ionic for *ὀδούς*, *odous*, tooth). The oldest known genus of the Ornithosauria, allied to the pterodactyl and rhamphorhynchus, and found fossil in the Lower Liassic rocks near Lyme Regis, in the south of England. The head is large and the jaws are armed with two kinds of teeth—those in the anterior half of the jaws are large, irregularly arranged, and spreading, while those in the posterior portions of the jaws are small and closely set. Both pairs of legs are long and slender, and the fifth fingers of the fore limbs are greatly elongated, to furnish support for the membranous wings. Dimorphodon is the earliest known vertebrate animal that possessed the power of flight, and it antedated the earliest known bird, Archæopteryx, of the Kimeridgian or Upper Jurassic, by almost the entire epoch of the Jurassic period. See ORNITHOSAURIA; PTERODACTYL.

DIMORPHOUS. See ISOMORPHISM.

DIMS'DALE, THOMAS (1712-1800). An English physician, grandson of Robert Dimsdâle, one of the companions of William Penn on his first voyage to America, in 1682. He was born at Theyden-Gernon, was educated at Saint Thomas's

Hospital, and practiced medicine at Hertford. His work upon inoculation, entitled, *The Present Method of Inoculation for the Smallpox*, was first published in 1767, and was subsequently frequently reprinted. His fame as an inoculator for the smallpox spread rapidly, and, at the invitation of the Empress Catharine, he in 1768 visited Saint Petersburg to inoculate the Empress and several of her family. For this service he received a sum equivalent to $50,000, and an annuity, besides other valuable gifts. In 1784 he made another voyage to the Continent, and visited the courts of Saint Petersburg, Vienna, and Berlin. His medical works include: *Thoughts on General and Partial Inoculation* (1776); *Observations on the Plan of a Dispensary and General Inoculation* (1780); *Tracts on Inoculation* (1768 and 1781).

DIM'YA'RIA. See LAMELLIBRANCHIATA.

DI'NAH. The daughter of Jacob and Leah. According to Genesis xxxiv. she was violated by Shechem, the son of Hamor, a Hivite ruler. An alliance with the sons of Jacob was proposed and accepted, on condition that Shechem's people be circumcised. Before their wounds were healed, however, they were treacherously murdered by Simeon and Levi, brothers of Dinah. For this deed Jacob rebuked his sons. Originally the two brothers were apparently slain themselves, as the curse upon them in Genesis xlix. shows. It is generally assumed by modern Bible scholars that Dinah is the eponym of an Israelitish clan whose absorption by marriage in the city population of Shechem was avenged by the kindred tribes of Simeon and Levi with a ruthlessness to which their own dissolution was afterwards traced. The author seems to have regarded the Hivites as uncircumcised. This, however, may be due to ignorance of the customs of an earlier population that had completely disappeared. See CIRCUMCISION.

DINAH, AUNT. The wealthy aunt of Walter, in Sterne's *Tristram Shandy*.

DINAN, dē'näN' (Gall., fortress on the water, from its situation on the Rance). A town in the Department of Côtes-du-Nord, France, picturesquely situated on the Rance, 30 miles northwest of Rennes, and 14 miles south of Saint Malo (Map: France, N., C 4). It stands on the summit of a steep hill of granite, with the Rance flowing through a valley 250 feet below and crossed by a fine stone viaduct 130 feet high and 810 feet long. The town is surrounded by old walls, pierced by four gates, and was formerly defended by a strong mediæval castle, still in an excellent state of preservation, and part of which has been converted into a prison. In the older district the streets are crooked, narrow, and steep, many of the buildings being crazy constructions of wood; but in some parts its overhanging houses, and arcades resting on carved granite pillars, present many architectural features attractive to antiquarian and artist. The Cathedral of Saint Sauveur is a peculiar but beautiful building, the north side being in the Gothic, the south in the Romanesque style. In the north transept an inscription points out where the heart of Bertrand Duguesclin is buried. Dinan has an interesting museum. Its industries include the manufacture of fine linen, of sailcloth, cotton and woolen goods, beet-root sugar, etc. It has also some barge-building yards, and its position near the head of navigation on the Rance favors a good coasting and inland trade, by which its products are widely distributed. Population, in 1891, 10,444; in 1901, 10,534. Dinan dates from the Roman period; the chief event in its long history was the siege by the English, under the Duke of Lancaster, in 1359.

DINANT, dē'näN' (Gall., fortress on the water, from its situation on the Meuse). A town of Belgium, in the Province of Namur, situated on the Meuse, 17 miles by rail from Namur (Map: Belgium, C 4). The most noteworthy buildings of Dinant are the Church of Notre Dame, an ancient and richly decorated Gothic structure, and the town house, once the palace of the princes of Liège. Dinant has several mills for sawing marble, paper-mills, breweries, tanneries, factories for the production of metal ware, and glass-works. In the Middle Ages Dinant was famous for its copper ware. It is now noted for its gingerbread. Dinant, which dates from the sixth century, has suffered greatly from frequent sieges. In 1466 Philip, Duke of Burgundy, attacked it with a strong force, and drowned a large number of its inhabitants after the town was taken. In 1554 and 1675 it was taken and plundered by the French. Population, in 1902, 7551.

DINAPUR, dē'nä-po͞or'. An important military station in the Patna district, Province of Behar, British India, on the right bank of the Ganges, 10 miles above Patna (Map: India, D 3). It contains spacious barracks. In 1857 it was the scene of the mutiny of three Sepoy regiments. Population, in 1891, 44,419; in 1901, 33,699.

DI'NAR. One of the so-called Kufic coins, of gold, with a value of about $2.60. The name itself is a corruption of the Latin *denarius* (q.v.).

DINAR'CHUS (Gk. *Δείναρχος*, *Deinarchos*) (c.361-291 B.C.). A Greek orator, born in Corinth. Going early to Athens, he studied with Demetrius Phalereus and Theophrastus, and became a writer of speeches. Of these there were many, but only three are extant. Until the removal of the greater orators he was inconspicuous, and always mediocre, enjoying some favor chiefly because of lack of rivals. His most successful period was that of the governorship of Demetrius Phalereus, after which he retired as an exile to Chalcis, returning to Athens in B.C. 292. For his speeches, consult: Mätzner (Berlin, 1842); Thalheim (Berlin, 1887); and Blass, *Attische Beredsamkeit* (Leipzig, 1887-93).

DINARD, dē'när', or **DINARD-SAINT ENOGAT,** säN'tā'nō'gä'. The capital of a canton in the Department of Ille-et-Vilaine, France, on the estuary of the Rance, opposite Saint Malo and Saint Servan. It is the most fashionable sea-bathing resort in Brittany, and is a picturesque modern town, situated on a rocky promontory commanding beautiful views. It has elegant villas and summer cottages, a fine sandy beach, well-appointed bathing establishments, a casino, an American and English colony, and is greatly frequented by foreign tourists. Saint Enogat, part of the cantonal town, is an ancient village, three-quarters of a mile to the northwest, with a fine bathing-beach on the bay of Saint Malo. Population, in 1901, 4787.

DINARIC RACE, dī-năr'ĭk (from the Dinaric Alps). A name applied by Deniker to the dark, short-headed, tall people (reputed tallest in the world) along or near the coast of the northern Adriatic, especially in Bosnia, Dalmatia, and Croatia; also in Rumania, Venetia, among the Slovenes, the Ladinos of the Tyrol, the Romansch of Switzerland, and in parts of France. Stature, 1.68 m. to 1.72 m. average; cephalic index, 85-86; brown or black wavy hair, dark eyes, straight eyebrows, long faces, delicate aquiline noses, tawny skin. Consult: Deniker, *Races of Man* (London, 1900); Ripley, *Races of Europe* (New York, 1899).

DINAR′ZADE. In the *Arabian Nights*, the sister of Scheherazade, whose husband purposed to strangle his bride at daybreak. Dinarzade spends her nights in the bridal chamber, and just before every dawn demands another story, thus interesting the Sultan and causing him to forego his intention.

DINCKLAGE - CAMPE, dĭṉk′lȧ-ge-käm′pe, Emmy von (1825-91). A German novelist. She was born on the family manor at Campe, Hanover. She traveled extensively in Europe and also visited the United States (1880). Her fine powers of observation and the poetic beauty of her descriptions, particularly of the Ems region, in which she lived, won for her the title 'Die Dichterin des Emslandes.' Her novels, tales, and romances, several of which have been translated, include: *Tolle Geschichten* (1870); *Emsland-Bilder* (1881); *Jung Alarichs Braut* (1890).

DINDINGS, dĭn-dĭngz′, The. A portion of the British colony of the Straits Settlements (q.v.), consisting of the small island of Pangkor, off the western coast of the Malay Peninsula, and a portion of Perak (q.v.) (Map: Burma, D 6).

DINDORF, dĭn′dôrf, Ludwig August (1805-71). A German classical philologist of distinction. His abilities, however, were somewhat overshadowed by the genius of his elder brother, Wilhelm (q.v.). He was born in Leipzig, January 3, 1805, and studied under Gottfried Hermann. In 1823 he began his literary activity by publishing, with full critical commentary, Xenophon's *Symposium* and *Agesilaus*. From this time to his death he kept almost equal pace with his brother in editing critical texts, although he centred his attention chiefly on the historians. He published editions of *Thucydides* (1824), *Xenophon* (1853-66), *Diodorus Siculus* (last ed., 1867-68), *Pausanias* (1845), *Polybius* (1866-68), *Dio Cassius* (1863-65), *Zonaras* (1868-75), the collection of *Historici Græci Minores* (1870-71). For the *Corpus Script. Historiæ Byzantinæ* he edited *Johannes Malalas* (1831) and the *Chronicon Paschale* (1832). He also published editions of *Hesiod* and *Euripides* (1825), and, with his brother and K. B. Hase, prepared a revised edition of Stephanus's *Thesaurus Græcæ Linguæ* (Paris, 1831-65). Consult: Bursian, *Geschichte der klassischen Philologie in Deutschland* (Munich, 1883); *Allgemeine deutsche Biographie*, vol. v. (Leipzig, 1877).

DINDORF, Wilhelm (1802-83). A German critic and philologist. He was born in Leipzig, studied at the university there, and early completed (vols. vii.-xiii., 1820-34) Invernizzi's edition of Aristophanes, and himself prepared a much smaller edition of that poet (2 vols., 1827). From 1828 to 1833 he was professor of the history of literature in the University of Leipzig. In 1833 he resigned his university post, and from that time was for many years an important contributor to the republication of Stephanus's *Thesaurus Linguæ Græcæ* (Paris, 1832-65). He edited all of the Greek dramatic poets separately, and prepared a collective arrangement in his *Poetæ Scenici Græci* (1830). His *Metra Æschyli, Sophoclis, Euripidis et Aristophanis* (1842) is a valuable study, and his lexicons to Sophocles (1870) and Æschylus (1873-76) are useful. For the *Corpus* of writers of the Byzantine period, of which Niebuhr was general editor, he edited several historians. In 1846-51 he published a notable edition of Demosthenes (9 vols.). He is to be ranked among the leading Hellenic scholars of recent times.

DIN′DYME′NE (Lat., from Gk. Δινδυμήνη). The by-name of Cybele, from Mount Dindymus in Phrygia, which was sacred to the goddess.

DINGAAN. A chief of the Zulus. See Zululand.

DINGELSTEDT, dĭng′el-stĕt, Franz von (1814-81). A German poet, dramatist, and novelist, born at Halsdorf, Hesse. He won popular favor but shocked official Germany by his liberal *Lieder eines kosmopolitischen Nachtwächters* (1841). His *Gedichte* (1845) were less offensive and more poetic. His somewhat frivolous manner of dealing with serious problems is shown in his later sketches of travel *Das Wanderbuch* (1847) and his society novel, *Die Amazone* (1868). He adapted Molière and Shakespeare to the German stage, wrote *Studien und Kopien nach Shakespeare* (1858) and a successful tragedy, *Das Haus der Barneveldt* (1851). He won great success as a theatrical director at Munich, Weimar, and Vienna, was ennobled in 1867, and made baron in 1876.

DINGLE, dĭn′g'l. A seaport, the most westerly town in Ireland, in County Kerry, 39 miles west-northwest of Killarney (Map: Ireland, A 4). It has an antique aspect, some of the houses having been built in the sixteenth century, in the Spanish style, with stone balconies, etc. The chief exports are corn and butter to Liverpool. Dingle was incorporated in 1585. Population, about 1700.

DINGLE, dên′glȧ. A town of Panay, Philippines, in the Province of Iloilo, situated 21 miles north of Iloilo. There are gold deposits in the vicinity. Dingle was founded in 1825. Population, in 1903, 12,129.

DING′LEY, Nelson, Jr. (1832-99). An American Congressman and journalist. He was born in Durham, Maine, graduated at Dartmouth in 1855, and in the following year became proprietor of the Lewiston *Journal*, of which he was also editor for twenty years. From 1862 to 1873 he served in the State Legislature, being Speaker in 1863 and 1864, and in 1874-75 was Governor. From 1881 until his death he was in Congress, where he was prominent as a specialist in tariff legislation, and was the framer of the tariff law of 1897, which bears his name.

DINGLINGER, dĭng′lĭng-ẽr, Johann Melchior (1665-1731). A German goldsmith and jeweler. He was born at Biberach, and in 1693 settled at Dresden. Here he became a favorite with Augustus the Strong and also with Peter the Great, who twice availed himself of his hospitality while on a visit to Dresden. His principal works, including "The Court of the Grand Mogul," a splendid table service consisting of more than 130 figures (1701-08); the "Bath of Diana" (1720), the tea service in gold, enamel, and ebony; and the "Joys of Life," are preserved in the Dresden Museum and in the Hermitage at Saint Petersburg. They are distinguished by great excellence of workmanship.

DINGO, dĭŋ′gô (native Australian name). The wild dog of Australia (*Canis dingo*), remarkable not only for being the only species of dog existing both wild and domesticated, but also for being the only carnivorous placental mammal in Australia. Some writers have regarded the dingo as an example of the domestic dog run wild, but the occurrence of its remains in the Quaternary strata of Australia, and even in cavern deposits of Pleistocene time, seems to make any such position untenable, though it is not impossible that the dingo may have been brought to Australia by man when he first set foot on that continent. The improbability of Australia possessing a native placental mammal of such large size, and the fact that it is not found in Tasmania or New Zealand, lend force to the belief that it is a dog of Asiatic origin brought to Australia by the Malays, who visited the northeast coast in their proas in historic ages. With the advance of civilization, the dingo, like the native races to which it is a companion, has gradually disappeared from large parts of southern and eastern Australia. As it is a serious menace to flocks of sheep, the settlers have made war upon it, and its extermination as a wild animal is not improbable. Its local extermination, however, has more than once been followed by so great an increase of grass-eating marsupials, upon which it preyed, that special efforts have been necessary to kill them off in turn.

The dingo is about two and one-half feet in length and somewhat less than two feet high. The ears are rather large and erect, and the tail is bushy. The color varies from pale brown to black, tawny shades being common. Windle says an average skull measures 302 millimeters in length and 172 millimeters in width. The dingo does not bark or growl in its wild state, but utters wolfish howls, especially at night. Tame dingoes, placed among other dogs, however, soon learn to bark. They are great hunters, pursuing their prey in packs, and running with the head carried high and the ears erect. They kill more than they can possibly use; are cunning and courageous; and themselves afford good sport for a pack of hounds.

The dingo is domesticated by the native Australians in all parts of the continent, the puppies being found in hollow trees and similar places where the female dingoes make their lairs. They are not only affectionate and faithful companions, but are of the greatest use to the natives, by assisting them in finding opossums, rats, snakes, and lizards for food. Nevertheless the black fellows hunt, kill, and eat the wild dingoes. A dash of dingo blood has been used to make the Australian Kelpie, the most prized of all cattle dogs. They are trained never to bark. Consult: Smyth, *The Aborigines of Victoria* (Melbourne, 1878); Wheelwright, *Bush Wanderings* (London, 1865). See DOG; and Plate of WOLVES AND DOGS.

DINGRAS, dên-gräs′. A town of Luzon, Philippines, in the Province of Ilocos Norte, 11 miles southeast of Laoag. It is situated in a fertile plain, surrounded by mountains, which is subject to inundations. Dingras was founded in 1598. Population, in 1903, 15,792.

DING′WALL. A royal burgh, the county town of the united counties of Ross and Cromarty, Scotland, at the head of the Cromarty Firth, 11 miles northwest of Inverness (Map: Scotland, D 2). It lies low, amid rich, fertile, and well-wooded ground, at the entrance to the beautiful valley of Strathpeffer, the famous sulphurous springs of which are five miles to the west. A short canal brings vessels drawing nine feet of water up to the town. Its prosperity depends on agriculture. Population, in 1891, 2283; in 1901, 2519. Near Dingwall is a vitrified fort, on a conical hill, and there are traces of an ancient castle where the Earls of Ross held their courts.

DIN′IAS (Lat., from Gk. Δεινίας, *Deinias*) and **DÉRCYL′LIS** (Lat., from Gk. Δερκυλλίς, *Derkyllis*). Characters in an old Greek novel, in twenty-four books, now lost, entitled *Incredible Things in Thule*, by Diogenes Antonius, a Syrian of the second century B.C. The work served as a source for various later authors.

DINICHTHYS, dī-nĭk′thĭs (Neo-Lat., from Gk. δεινός, *deinos*, terrible + ἰχθύς, *ichthys*, fish). A genus of fossil dipnoan fishes of large size belonging in the order Arthrodira, and found in the uppermost Devonian and Lower Carboniferous rocks of North America, and less commonly in Europe. The body is estimated to have had a length of 15 to 18 feet, but few traces of other portions than the heavy armor-plates of the head and anterior part of the trunk have been observed. The general form is similar to that of Coccosteus, with which it is quite closely related. The head was often over three feet in width and four or more feet long, and the bones of the skull were heavy plates, well joined together to form a solid dorsal head-shield. The eyes were of large size, as indicated by the form of the orbital notches in the margin of the head-shield. The dentition, which resembles that of the modern Protopterus, was very formidable. It consisted, in the upper jaw, of two large anterior triangular teeth that functioned as incisors, and two lateral oblong plates with sharp enameled cutting edges. The lower jaws are very strong and have, at their anterior ends, prominent sharp teeth that interlock with those of the upper jaw, and behind these the upper edges of the jaws are hardened by enamel and sharpened to form very efficient smooth or denticulate cutting edges, that must have engaged with the corresponding sharp edges of the upper jaw in a shear-like motion. The plates of the ventral surface of the head and those of the anterior part of the trunk resemble the corresponding plates in the genus Coccosteus, and there is a hinge-joint between the head-plates and the body-plates.

The larger number of these fossils have been found in the Upper Devonian Cleveland shale of Ohio, from which formation they were originally described by Prof. J. S. Newberry. The best-known species are Dinichthys Hertzeri and Dinichthys terrelli. Consult: Newberry, "The Palæozoic Fishes of North America," *Monograph* *of the United States Geological Survey*, vol. xvi. (Washington, 1890); Dean, *Fishes, Living and Fossil* (New York, 1895); Dean, "Contributions to the Anatomy of Dinichthys," etc., in *Transactions of the New York Academy of Sciences*, vol. xv. (1896); vol. xii. (1894); and vol. xvi. (1898). See LUNGFISH.

DINIZ DA CRUZ E SILVA, dê-nēz′ dȧ krōōz ê sêl′vȧ, ANTONIO (1731-99). A Portuguese poet, born in Lisbon. He is considered one of the revivers of the poetry of Portugal, and has been called the "Portuguese Pindar." His works are full of local color, and his odes are fine. *O Hyssope* (1802, and frequently since) has been translated into English and French. His collected works are entitled *Poesias* (1807-17).

DINIZULU. See ZULULAND.

DIN′KA (native name *Jyeng*). The largest negro tribe of the Egyptian Sudan, living on both sides of the White Nile between latitudes 12° and 6° N. They live chiefly from their numerous herds of cattle. The men go perfectly naked, and both sexes extract the two upper incisor teeth. Being brave warriors, they furnish the best material for the Sudanese regiments. The most complete grammar of their language is that of Mitterrutzner (Brixen, 1866). On their manners and customs, consult Schweinfurth, *In the Heart of Africa*, translated by Frewer (London, 1873); Kaufmann, *Schilderungen aus Central Afrika* (Brixen, 1862).

DINKARD, dên-kärd′ (Pahlavi *Dīnkarṭ*, acts of religion). A collection of facts concerning the Zoroastrian religion, compiled shortly after the Mohammedan conquest of Persia.

DIN′MONT, DANDIE. An eccentric border farmer in Scott's *Guy Mannering*. An upland sheep-raiser of the author's acquaintance named Willie Elliot, of Millburnholm, was probably the original of the character.

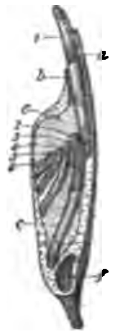
DINO COMPAGNI, dē′nô kôm-pä′nyê. See COMPAGNI, DINO.

DINOCERAS, dī-nŏs′ĕr-*as*. See TINOCERAS.

DINOC′RATES (Lat., from Gk. Δεινοκράτης, *Deinokratēs*). A Greek architect of the time of Alexander the Great. According to Vitruvius, he visited the camp of Alexander with letters of introduction, but was unable to secure an audience. Relying upon his athletic figure, he at length decked himself in the costume of Heracles, with lion's skin and club, and thus attracted the notice of the King. He then proposed to Alexander to carve the huge mass of Mount Athos into a human figure, holding a city in one hand and a vessel of water in the other. The work was never attempted, but Dinocrates was taken into the favor of the King, and employed as architect in the foundation of Alexandria. He was also employed by the Ephesians in the reconstruction of the Temple of Diana (q.v.). The story that he designed a temple of Arsinoë, wife of Ptolemy II., Philadelphus, in which an iron statue of the Queen was to be held suspended by a loadstone roof, is, on chronological grounds, impossible.

DINOR′NIS (Neo-Lat., from Gk. δεινός, *deinos*, terrible + ὄρνις *ornis*, bird). A genus of gigantic, recently extinct, ratite birds, the typical moas, taken as the type-genus of the family Dinornithidæ. See MOA; EXTINCT ANIMALS.

DI′NOSAU′RIA (Neo-Lat., from Gk. δεινός, *deinos*, terrible + σαῦρος, *sauros*, lizard). An order of fossil reptiles, found only in rocks of Mesozoic age, and containing some of the most wonderful and bizarre land animals that have ever lived. In general, the dinosaurs present the same reptilian characters as do the crocodilians and pterosaurians, which have been derived from the same original stock, and within the order the form is so variable that it is difficult to find reliable distinctive characters. The more primitive genera can scarcely be distinguished from the generalized crocodiles, others resemble the rhynchocephalians, others the pterosaurians, and still others are far removed by specialization along particular lines and afford most remarkable and extravagant forms. The closest living allies of the dinosaurs are the crocodiles and the ratite birds (ostrich, etc.), which, with the more primitive dinosaurs, were probably descended from a common ancestral stock in early Triassic times.



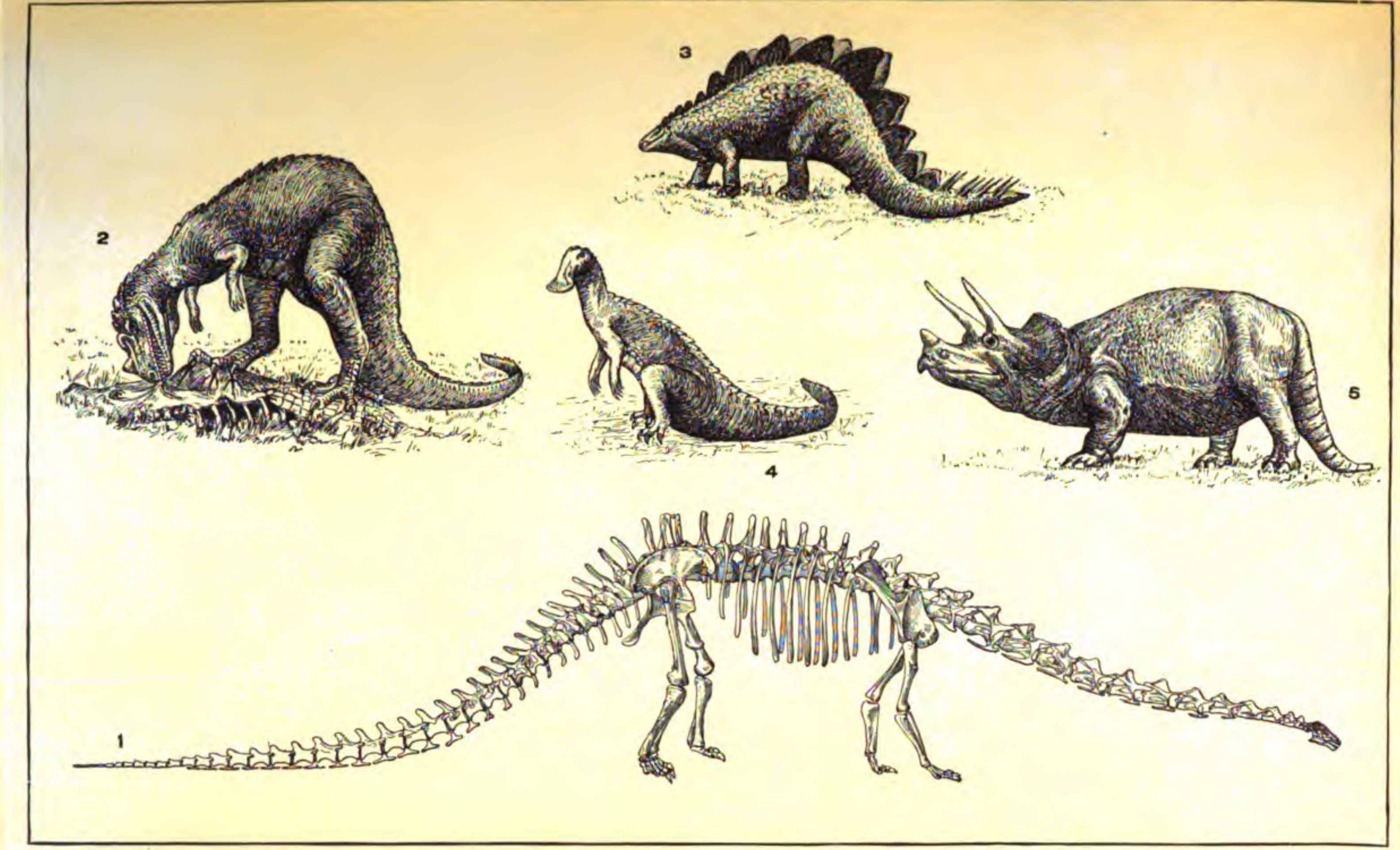
TOOTH OF DIPLODOCUS.

Section of maxillary bone of *Diplodocus longus*, showing functional tooth (fourth) in position and five successional teeth (2, 3, 4, 5, 6) in dental cavity; *a*, outer wall; *b*, inner wall; *c*, *c*, cavity; *f*, foramen.

SKULL OF CLAOSAURUS ANNECTENS.

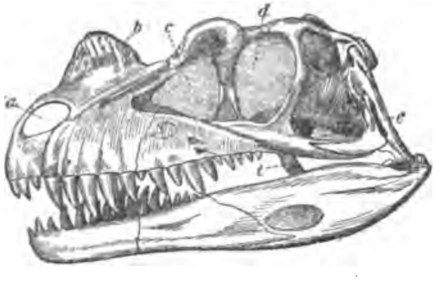
The skeleton of dinosaurs presents some variations from that of other reptiles. The cranium has two temporal vacuities, the vertebræ are usually double concave, though several anterior vertebræ in the more primitive genera may be concave on the posterior surface only; the sacrum is usually of three or five fused vertebræ, but the normal reptilian number, two, is found in the primitive forms. The pelvis is of bird-like structure, often with anterior and posterior elongation of the elements. The limbs are fitted for locomotion on land; the forward pair is often reduced in size so that locomotion is bipedal. Reduction of the number of toes on the hind feet to three is common. In some gigantic genera the tail was unusually strong and with the hind limbs formed a tripod support for the animal, which was thus enabled to raise its head to a height sometimes of thirty feet above the ground, and to overlook the vegetation of the marshes in which it wallowed. The dentition of dinosaurs is fitted for both carnivorous and herbivorous food. Beak-like structure of the jaws is common. The teeth are often implanted in sockets and in some genera they appear in successional series. The head of dinosaurs is usually disproportionately small, and the brain is always of very small size and low degree of convolution, indicating an inferior grade of intelligence in these animals. In some forms with small head, long neck, heavy body and hind quarters, and

DINOSAURS



1. SKELETON OF DIPLODOCUS (Order Sauropoda).
(2-5, Restorations, after Osborn and Knight)
2. CERATOSAURUS (Order Theropoda).
3. STEGOSAURUS (Order Orthopoda).
4. HADROSAURUS (Suborder Ornithopoda).
5. TRICERATOPS (Order Ceratopsia).

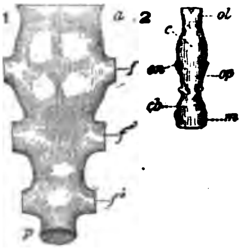
long heavy tail, where the hinder part of the body overbalances by far the forward portion, as in Brontosaurus, Diplodocus, Scelidosaurus, and Stegosaurus, the neural ganglion in the sacrum is many times larger than the cephalic ganglion or brain, a condition necessitated by the great mass of the body that must be innervated from the sacral ganglion in these animals.



SKULL OF CERATOSAURUS.

Skull of *Ceratosaurus nesicornis:* a, nasal opening; *b*, horn core; *c*, anteorbital opening (filled with matrix stone); *d*, orbit (ditto); *e*, lower temporal fossa (ditto); *t*, transverse bone.

In habits the dinosaurs were terrestrial, and often amphibious, and the structure of the tail in some genera indicates its use as a swimming organ. Some were of graceful, bird-like action, walking, running, or leaping on their three-toed hind limbs. Others were heavy, clumsy beasts, walking or crawling on their solidly built four legs. Dinosaurs vary greatly in size. The smallest are of the size of a chicken. The largest are the greatest land animals ever known to have existed, with lengths of 60 to 70 feet, heights of 10 to 20 feet, and weights estimated to have varied from 20 to 25 tons. Dinosaurs appeared in the early Triassic time, and during the Jurassic and Cretaceous periods they ruled the land, but toward the end of the Cretaceous they began to decline, and they finally gave way to the early mammals. The remains of the latest members of the order are found in the uppermost formations of the Cretaceous, namely the Laramie group of western America. Their remains have been found in the Mesozoic rocks of Europe, southern Asia, South Africa, North Australia, North and South America, and the most noted localities whence they have been obtained are those of Bernissart in Belgium, and the Rocky Mountain region of North America. The order Dinosauria is divided into three suborders, some of the peculiarities of which are here given. They are the Sauropoda, Theropoda, and Predentata.



CEPHALIC AND SACRAL GANGLIA.

Drawings of casts showing the expansions of the spinal cord of *Stegosaurus ungulatus.* (1) Cast of neural cavity of sacrum: a, anterior end; *p*, posterior end at exit of neural canal in last sacral vertebra; *f, f', f''*, foramina between the sacral vertebræ. (2) Cast of brain-cavity of same animal: *c*, cerebral hemispheres; *cb*, cerebellum; *m*, medulla; *ol*, olfactory lobes; *on*, optic nerve; *op*, optic lobes.

Sauropoda. This is the most primitive group of dinosaurs, resembling the crocodiles and rhynchocephalians in the structure of its skeleton and the proportions of its parts. It includes the gigantic herbivorous genera: Atlantosaurus, Cetiosaurus, Brontosaurus (q.v.), and Diplodocus (q.v.), with very small head, long neck, heavy trunk supported on strong plantigrade five-toed fore and hind limbs of equal size, and with a heavy long tail. The teeth are long, spatulate, and spreading. The bones are solid and heavy, and the pubis is simple. This group is mostly of Triassic and Jurassic age.

Theropoda. Carnivorous dinosaurs with cutting teeth in sockets. Their skeletons are of rather delicate construction and their vertebræ and limb-bones are hollow. Their five-toed fore limbs are of small size and apparently of little use as locomotory organs, but their three-toed hind limbs are strong and the toes are furnished with prehensile claws. These dinosaurs were digitigrade and they walked as do birds or leaped as do the kangaroos. The pelvic bones are elongated. Examples of this suborder are Anchisaurus and Ceratosaurus (qq.v.). Hallopus, a leaping dinosaur from the Jurassic of Colorado, and the bird-like Compsognathus, one of the smallest dinosaurs, from the Jurassic lithographic limestones of Solenhofen, Bavaria, also belong in this division.

Predentata. Here are included the most specialized and hence the most extravagantly formed of dinosaurs. They were all herbivorous animals that walked on either four or two feet. Some of them undoubtedly ran with great rapidity on their hind legs, using the tail as a balance after the manner of certain modern lizards. In all of them the pelvis is provided with a postpubis, a character found in no other reptiles, but constant in the birds; and the ilium and ischium are elongated and variously modified. Another distinctive character is the presence of a predentary bone on the anterior end of the mandible which has a beak-like tip. Accordingly, the teeth are absent from the front of the jaws and are restricted to the posterior portions. The teeth are compressed, have crenulated edges, and they are frequently replaced by successional teeth. The Predentata comprise three divergent lines of descent—Stegosauria, Ceratopsia, Ornithopoda.

Stegosauria. In form these dinosaurs resemble most closely the Sauropoda. Their vertebræ are all biconcave, their heads are very small, and the hinder parts of their bodies are enormously developed. Many of them were armored. Omosaurus, from the Upper Jurassic of England, has strong dorsal spines; Polacanthus, of the English Wealden, has the lumbar-sacral region inclosed in solid armor-plate; Scelidosaurus, of the English Lower Lias, has a row of small vertical plates along the dorsal line. The extreme of ornamental armor is seen in Stegosaurus (q.v.) from the Upper Jurassic of Colorado and Wyoming, which has a row of heavy large triangular bony plates extending from the back of the head along the back to the tip of the tail.

Ceratopsia. This group includes the horned dinosaurs, land reptiles of gigantic size and formidable appearance, which were evolved in late Mesozoic time after the dinosaur race had begun to decline. They are probably highly specialized descendants from the Stegosaurian race. Their remains have been found in the Upper

Cretaceous rocks of Europe, but the best material has come from the Laramie group of Wyoming and Colorado. The prominent feature of these animals is the large size of the head. In Triceratops (q.v.), which attained a length of 25 feet, the head has a length of 6 feet, and it is provided with three formidable horns, and with a broad posterior expansion or crest, formed from the parietal bones, that projects some distance over the neck. The jaws have strong beaks in front and two-rooted teeth in their posterior portions. The skeletons of these dinosaurs are heavily built, the bones are solid, the five-toed fore limbs and the three or four-toed hind limbs are about equal in size, the feet were digitigrade, and the toes were hoofed like those of a rhinoceros. The body was protected by a thick hide, sometimes armored with bony plates, and the tail was smaller than in any other dinosaurs. The best-known genera are Agathaumus, Triceratops (q.v.), and Sterrholophus.

Ornithopoda. These are the most bird-like of the dinosaurs, with small five-toed fore limbs, and well-developed three-toed hind limbs. All the limb-bones are hollow. They were unarmored, herbivorous animals with bipedal walking, running, or leaping motion. Iguanodon (q.v.), of the Belgian Jurassic, with a length of 20 feet, is perhaps the best-known genus. Claosaurus or Thespesius (q.v.), from the North American Cretaceous rocks, attained a length of 35 feet. Hadrosaurus (q.v.), from the Laramie group, had a spoon-bill beak, like that of Ornithorhynchus. Here, also, belongs Nanosaurus, the smallest known dinosaur, which was scarcely as large as a domestic fowl, found in the Upper Jurassic rocks of Colorado.

Fossil remains of dinosaurs are to be seen only in the larger museums of the country. The American Museum of Natural History in Central Park, New York City, has the finest series of skeletons, many of which are accompanied by water-color restorations of these animals. Other museums where dinosaurs may be seen are the United States National Museum at Washington, Peabody Museum of Yale University, Carnegie Museum at Pittsburg, where a complete skeleton of Diplodocus is mounted, the Field Columbian Museum at Chicago, and the museum of the University of Wyoming at Laramie.

Bibliography. Marsh, "The Dinosaurs of North America," *Annual Report of the United States Geological Survey*, vol. xvi., part i. (Washington, 1896); Lucas, *Animals of the Past* (New York, 1901); Woodward, *Outlines of Vertebrate Palæontology for Students of Zoölogy* (Cambridge, 1898); Hatcher, "Diplodocus, Marsh, Its Osteology, etc." *Memoirs of the Carnegie Museum*, vol. i. No. 1 (Pittsburg, 1901); Hutchinson, *Extinct Monsters* (1892); id., *Creatures of Other Days* (1894); and Riggs, *The Dinosaur Beds of the Grand River Valley of Colorado* (Chicago, 1901). See, also, Anchisaurus; Brontosaurus; Ceratosaurus; Diplodocus; Hadrosaurus: Megalosaurus; Stegosaurus; Thespesius; Triceratops.

DI'NOTHE'RIUM (Neo-Lat., from Gk. *δεινός, deinos*, terrible + *θηρίον thērion*, beast, diminutive of *θήρ. thēr*, wild beast). A genus of fossil proboscideans allied to the modern elephant and the extinct mastodon, of which fragmentary remains have been found in the Miocene and Pliocene rocks of Europe. No complete skeleton has yet been found. The skull, which is essentially elephantine, is longer, lower, and tapers more in front than does that of the modern elephant. The structure of the nasal bones and of the front of the cranium indicates that the animal had a proboscis, which was not, however, so prominent an organ of prehension as is that of the elephant. The molar teeth resemble those of the mastodon in structure, though they are smaller and have fewer transverse ridges on the crowns. The upper incisors, which attain to such great developments of tusks in the mastodon and elephant, are absent in the dinotherium, but the lower incisors, together with the fused ends of the mandibles, are turned downward and backward to form a pair of strong tusks, comparable with, though not at all analogous to, those of the walrus. The bones which have been found associated with these dinotherium skulls, and which probably belong to individuals of the same genus, are of massive build like those of other proboscidea, and indicate that the dinotherium lived in about the same habitats of dense forests with soft yielding ground as do the modern elephants, and that it was not an amphibious animal, as was for a long time supposed. The largest species of dinotherium lived in Pliocene time and rivaled in size the mastodon and mammoth. The skulls of this genus are found quite abundantly in the Miocene deposits of central Europe, in the Lower Pliocene of India and the Upper Pliocene of Greece, and are often associated with remains of the rhinoceros. No dinotherium remains have yet been found in America. See Elephant; Mammoth; Mastodon.

DINTER, dĭn'tẽr, Gustav Friedrich (1760-1831). A German pedagogue and author, born at Borna. He studied theology and pedagogy at Leipzig; held several pastorates, was appointed director of the Teachers' Seminary at Dresden in 1797, and became professor of theology at the University of Königsberg in 1822. He was liberal in his religious views, and practical in his methods of education. His lectures and writings were distinguished by remarkable clearness of exposition. The seminary at Dresden flourished under his management. He was a prolific author and wrote more than sixty distinct works. They include: *Die vorzüglichsten Regeln der Katechetik* (1802; 13th ed. 1862); *Malwina, ein Buch für Mütter* (1818; 5th ed. 1860); *Unterredungen über die Hauptstücke des lutheranischen Katechismus* (1806-23; frequently reprinted).

DIN'WIDDIE, Robert (c.1690-1770). A Colonial Governor of Virginia. He was born in Scotland; was for some time a clerk in the customs service, was appointed surveyor of customs for the Colonies, and in 1752 came to Virginia as Lieutenant-Governor. He immediately busied himself with plans for the French and Indian War, then impending, and in 1753 sent Washington to demand the withdrawal of French traders and soldiers, who had established themselves on land claimed by Virginia. In 1755 he helped the expedition sent against forts Duquesne, Niagara, Frontenac, and Crown Point. He was in continual conflict with the Colonial Legislature, which persistently refused to vote adequate funds for carrying on the war, and in consequence he advocated the imposition of an arbitrary poll tax by Parliament. This, combined with his arrogance, his avarice, and his indecision, made him unpopular, and led to his recall in 1758.

DI′O CAS′SIUS COC′CEIA′NUS (Gk. Δίων Κάσσιος Κοκκηιανός, *Diōn Kassios Kokkēianos*) (c.150-235). A celebrated Greek historian. He was born at Nicæa, in Bithynia. He held various high offices of State under the Roman emperors, was twice consul, and enjoyed the intimate friendship of the Emperor Alexander Severus. He is best known by his *History of Rome*, in eighty books, from the arrival of Æneas in Italy to A.D. 229, of which only twenty-four (36-60, covering the years B.C. 68 to A.D. 47) have reached us fairly complete. The others are known to us only from fragments and the abridgment made by Xiphilinus in the eleventh century. Dio's high position gave him free access to the national archives, and as an authority on some points—especially on the imperial epoch of Roman history—his work is of considerable value. He wrote on the model of Thucydides, to whom, indeed, he is far inferior, both in vigor of judgment and acuteness of criticism; yet many passages of his *History* might he quoted as among the best samples of the rhetoric of the age in which he lived. The *History* is edited by Boissevain (Berlin, 1895-1901). See *Dio's Rome: English Form*, by Foster (Troy, 1906).

DI′OCESE (OF. *diocise*, *diocese*, Fr. *diocèse*, Lat. *diœcesis*, from Gk. *διοίκησις*, *dioikēsis*, administration, from *διοικεῖν*, *dioikein*, to keep house, from *διά*, *dia*, through + *οἰκεῖν*, *oikein*, to inhabit, from *οἶκος*, *oikos*, house, Lat. *vicus*, village, Skt. *viś*, house). In the Roman Catholic and Anglican churches, a district committed to the pastoral care of a bishop. The term was used in the civil administration of the later Roman Empire, which Constantine divided into thirteen districts called dioceses, and these again into one hundred and twenty provinces. When the Church had perfected her episcopal organization and received the recognition of the State, she modeled her territorial divisions on those of the civil administration. This adaptation appears to have been completed by the end of the fourth century. There developed an exarch or patriarch in each of the great dioceses, and a metropolitan or primate in each province, the word *παροικία*, or *parish*, being applied to what we now call a diocese. At a later period the word diocese was transferred to the territory of a bishop's jurisdiction, and the word patriarchate used for the ancient diocese. In the Eastern Churches the civil term *eparchy* is used to this day for a diocese. At the present time dioceses of the Catholic Church are erected by the Pope in consistory. Before the erection of a diocese, administrative districts not formally so constituted are styled prefectures apostolic and vicariates apostolic. Dioceses are created in the Church of England by act of Parliament. In the American Episcopal Church new dioceses are created by primary conventions of the clergy and laity of the district, and are then admitted into union with the general convention by vote of that body.

DI′O CHRYSOS′TOMUS (Lat., from Gk. *χρυσόστομος*, *chrysostomos*, golden-mouthed, from *χρυσός*, *chrysos*, gold + *στόμα*, *stoma*, mouth). An eminent Greek rhetorician. He was born at Prusa, in Bithynia, toward the middle of the first century A.D. His father, Pasicrates, paid great attention to his education, which was also enriched by travel. Dio, after residing for some time in his native town, came to Rome, where, however, he had the misfortune to excite the suspicion of the Emperor Domitian, and was in consequence obliged to flee. On the accession of Nerva, A.D. 96, he returned to Rome, and was honorably received. Nerva's successor, Trajan, held Dio in the highest estimation, even permitting him to ride beside himself in the imperial chariot. His excellent disposition procured him many friends, while his remarkable powers of oratory excited universal admiration. He died at Rome about A.D. 117. Dio left a very great number of orations, of which eighty are still extant in whole, with fragments of fifteen others. They discuss questions in politics, morals, and philosophy, and are written in good Attic Greek. According to Niebuhr, he was "the first writer after Tiberius that greatly contributed toward the revival of Greek literature." Good editions of Dio's orations are those of Reiske (Leipzig, 1784), Emperius (Brunswick, 1844), and Dindorf (Leipzig, 1857).

DIOCLES, dī′ō-klēz. See CISSOID.

DIOCLES (Lat., from Gk. *Διοκλῆς*, *Dioklēs*). A Syracusan demagogue of the fourth century B.C., noted for his code of laws. He was a democratic leader, and his code, which continued in force until the Roman Conquest, tended to popular sovereignty. His failure to bury the dead, after his vain attempt to raise the siege of Himera, resulted in his banishment in B.C. 408.

DIOCLETIAN, dī′ō-klē′shan, BATHS OF. Baths at Rome, built by Diocletian and Maximian, opened in A.D. 306 and still used at the time of Theodoric. The ruins were converted into a Carthusian monastery, and the tepidarium into the Church of Santa Maria dei Angeli, by Michelangelo; a circular hall at the southwest corner of the outer wall was made into the Church of San Bernardo in 1594. The cloisters of the monastery are now used as a temporary museum.

DIOCLETIAN, GAIUS AURELIUS VALERIUS DIOCLETIANUS. A Roman Emperor (A.D. 284-305). He was born of humble parents in Dalmatia (A.D. 245). He adopted a military career, and served with distinction under Aurelian and Probus, accompanied Carus on his Persian campaign, and finally, on the murder of Numerianus having been discovered at Chalcedon, he was proclaimed Emperor in 284 by the army on its homeward march. The suspected assassin of Numerianus, the prefect Arrius Aper, he slew with his own hands, in order, it is alleged, to fulfill a prophecy communicated to him, while still a lad, by a Druidess of Gaul, that he should accede to a throne as soon as he had killed an *aper* (wild boar). In 285 Diocletian commenced hostilities against Carinus (the joint Emperor along with the deceased Numerianus), who, although victorious in the decisive battle that ensued, was murdered by his own officers, thus leaving to Diocletian the undisputed supremacy. His first years of government were so molested by the incursions of barbarians that, in order to repel their growing aggressiveness, he took to himself a colleague—namely, Maximian—who, under the title of Augustus, became joint Emperor in 286. Diocletian reserved for himself charge of the eastern half of the Empire, and gave the western to Maximian. Still the attacks of the barbarians continued as formidable as ever. The Empire was menaced by the Persians in the east, by the Germans and other barbarians in the west; and in order to provide for its permanent security, Diocletian subjected it to a still further division. In 292 Constantius Chlorus and Galerius were proclaimed as Cæsars, and the distribution of the Roman Empire was now fourfold, Diocletian taking the east, with Nicomedia as his seat of government; Maximian, Italy and Africa, with Milan as his residence; Constantius, Britain, Gaul, and Spain, with Treves as his headquarters; Galerius, Illyricum and the entire valley of the Danube, with Sirmium as his imperial abode. It was upon his colleagues that most of the burden of engaging actively in hostilities fell, as Diocletian seldom took the field in person. Among the conquests, or rather reconquests, that were made under his rule, may be enumerated that of Britain, which, after maintaining independence under Carausius and Allectus, was, in 296, restored to the Empire; that of the Persians, who were defeated and compelled to capitulate in 298; and that of the Marcomanni and others of the northern barbarians, who were driven beyond the Roman frontier. Diocletian, after twenty-one years' harassing tenure of government, desired to pass the residue of his days in tranquillity. On May 1, 305, accordingly, he abdicated the imperial throne at Nicomedia, and compelled his colleague Maximian (much against the latter's will) to do likewise at Milan. Diocletian sought retirement in his native province of Dalmatia, and for eight years resided at Salona (now Spalato), devoting himself to philosophic reflection, to rural recreation, and to horticultural pursuits. Two years before his abdication he was instigated by his colleague Galerius to that determined and sanguinary persecution of the Christians for which his reign is chiefly memorable. He died in 313. Consult Mason, *The Persecution of Diocletianus* (London, 1876), and the *Life*, by Preuss (Berlin, 1868).

DIODATI, dē'ō-dä'tē. GIOVANNI (1576-1649). A Swiss Reformed theologian. He was born at Geneva, of a noble Italian family which, having accepted the Reformation, was driven from home by persecution. His progress in letters was so rapid that Beza caused him to be appointed professor of Hebrew in Geneva at the age of twenty-one. He became a pastor of the Reformed Church there, and in 1609 professor of theology. About this time he endeavored to spread the doctrines of the Reformation in Venice and other cities of Italy, but without success. In 1614 he went to Nîmes, where he preached for three years, and in 1618 he was sent to the Synod of Dort, to represent the Genevese Church. Here his talents were so highly estimated that he was one of the divines appointed to draw up the articles of the synod. He died at Geneva in 1649. Diodati was a somewhat intolerant Calvinist, but as a preacher he was eloquent, persuasive, and conscientious. His Italian translation of the Bible—the one still generally used among the Italian Protestants—appeared in 1607; his French, in 1644. Among his other works may be mentioned his *Annotationes in Biblia* (1607); *De Fictitio Pontificiorum Purgatorio* (1619); and *De Iusta Secessione Reformatorum ab Ecclesia Romana* (1628). For his life, consult Eugène de Bude (Geneva, 1869).

DI'ODO'RUS (Lat., from Gk. Διόδωρος), surnamed SICULUS. A Greek historian, born at Agyrium, in Sicily. He flourished in the times of Cæsar and Augustus—the latest date to which he refers is B.C. 21—traveled in Asia and Europe, and lived a long time in Rome, collecting the materials of his great work, the compilation of which occupied thirty years. This work, the *Library* (Βιβλιοθήκη), was a universal history, in forty books, from the beginning to B.C. 60-59. It was divided by the author into three parts. The first six books contain an account of the mythical history of all known nations down to the time of the Trojan War; the second (books 7 to 17) cover the period from the Trojan War to the death of Alexander; the third (books 18 to 20) extended to Cæsar's Gallic wars. Only books 1 to 5 of the first part and books 11 to 20, containing the history from the expedition of Xerxes to the war against Antigonus, are preserved entire; of books 21 to 40 we have only scanty extracts and quotations by other writers. Diodorus took Ephorus for his model, and set to work on his history with excellent purpose; but the annalistic arrangement of his work in itself was wholly unfitted for so comprehensive a history. Furthermore, Diodorus had no experience in practical life and military training, so that he lacked the insight necessary to carry out his undertaking; his style is monotonous and wearisome, and he was almost wholly without critical historical judgment. Yet his work is valuable for its contents, and replaces to some extent the lost historians. The best edition is by Dindorf, revised and provided with critical apparatus by Vogel (Leipzig, 1888-93).

DIŒ'CIOUS PLANTS. See DIŒCISM.

DIŒ'CISM (from Gk. *δι-*, *di-*, double + *οἶκος*, oikos, house). Primarily this word applies to that condition in plants in which the male and female organs are borne by different individuals. In its original application, however, it referred to the fact that in some seed-plants the stamens and pistils are borne by separate individuals. Diœcism in mosses and ferns, therefore, does not mean the same thing as diœcism in seed-plants. In the mosses and ferns it refers to the fact that in certain species one gametophyte (prothallium in ferns) bears the antheridia and another the archegonia. In seed-plants it refers to the fact that one sporophyte produces the stamens (microsporophylls) and another produces the carpels (megasporophylls). As thus applied, the name has no morphological significance; but in both cases it refers in a sense to a similar physiological condition. If the diœcism, as exhibited by mosses and ferns, be strictly traced into the seed-plants, it is discovered that they are all diœcious, for in all of them the male cells and eggs are produced by different gametophytes. This is merely a result of heterospory, and hence heterosporous plants are essentially diœcious, if considered from the standpoint of the sex organs.

The significance of the diœcism of seed-plants is not clear, although many see in it a condition which secures all of the advantages of cross-pollination. On the other hand, it is in general a primitive condition, for many gymnosperms and the most primitive angiosperms are diœcious. Although prevailingly displayed by the more primitive groups of seed-plants, it is by no means wanting in the highest groups, so that it is not an essential indication of either a primitive or a derived condition. There are cases in which it is evident that the diœcious habit is a derived one, since in the stamen-bearing flowers rudiments of the carpels may be found, and in the carpel-bearing flowers rudiments of stamens often occur. It is evident that in such cases the diœcious condition has come from what is called the bisporangiate condition—i.e. one in which the two sets of sporangia occur in the same flower. Diœcious flowers are necessarily monosporangiate; but flowers may be monosporangiate and yet both kinds of flowers may occur upon the same individual. The monosporangiate and diœcious conditions are therefore not synonymous.

DIOGENES, dī-ŏj'e-nēz (Lat., from Gk. Διογένης) (c.412-323 B.C.). A cynic philosopher. He was a native of Sinope, in Pontus. His father, Icesias, a banker, was convicted of debasing the coinage, and his son, being implicated in the matter, was obliged to leave Sinope. On coming to Athens he attached himself to Antisthenes, by whom, however, his first advances were repelled. In spite of his inhospitable reception, Diogenes renewed the attempt to find favor with Antisthenes; but though driven away by blows, his perseverance at last prevailed, and Antisthenes, moved with compassion, consented to admit him as a pupil. Diogenes now plunged into the extreme of austerity and self-mortification. His clothing was of the coarsest, his food of the plainest, and was provided by the pity of the Athenians. His bed was the bare ground, whether in the open street or under the porticoes. On one occasion, in default of a better place, he took up his residence temporarily in a huge jar, πίθος, in the Metroum, that thereby he might show his contempt of ordinary men. His eccentric life did not, however, cost him the respect of the Athenians, who admired his contempt of comfort and allowed him a wide latitude of comment and rebuke. Practical good was the chief aim of his philosophy; for literature and the fine arts he did not conceal his disdain. He laughed at men of letters for reading the sufferings of Odysseus while neglecting their own; at musicians who spent in stringing their lyres the time which would have been much better employed in making their own discordant natures harmonious; at savants for gazing at the heavenly bodies, while sublimely incognizant of earthly ones; and at orators who studied how to enforce truth but not how to practice it. He was seized by pirates on a voyage to Ægina, and carried to Crete, where he was sold as a slave. When asked what business he was proficient in, he answered, "In commanding." He was purchased by a certain Xeniades of Corinth, who recognized his worth, set him free, and made him tutor to his children. It is here that he is said to have had his famous, but probably mythical, interview with Alexander the Great. The King opened the conversation with, "I am Alexander the Great," to which the philosopher answered, "And I am Diogenes the Cynic." Alexander then asked him in what way he could serve him, to which Diogenes rejoined, "You can stand out of the sunshine." Alexander is said to have been so struck with the Cynic's self-possession that he went away remarking, "If I were not Alexander, I should wish to be Diogenes." Diogenes died at Corinth in B.C. 323, according to tradition, on the same day with Alexander the Great. Diogenes was wholly concerned with practical wisdom, and established no system of philosophy. Certain literary works were early attributed to him, but were recognized as spurious even in antiquity. Consult Hermann, *Zur Geschichte und Kritik des Diogenes von Sinope* (Heilbronn, 1860); Zeller, *Philosophie der Griechen*, vol. i. (1889).

DIOGENES LAËRTIUS. A Greek writer, a native of Laërte, in Cilicia. He flourished apparently about the beginning of the third century A.D. The details of his life are not known to us. His chief work, *Lives of Philosophers*, in ten books, is a history of Greek philosophy from its beginnings. Diogenes, however, lacked the ability to handle his subject, and his interest lay rather in collecting biographical anecdotes and selecting passages from the works of his predecessors than in undertaking a critical account of the development of philosophic thought. Furthermore, he drew, not from original works, but from compendia and histories, especially from the writings of Diocles, Nicias, and Favorinus. Yet his work has preserved many valuable facts of which otherwise we should be ignorant. Especially interesting are the three letters of Epicurus to Herodotus, Pythocles, and Menœceus, quoted in book 10. The authenticity of the second letter, however, is questioned. Diogenes also composed epigrams, some of which are quoted in his larger work. The *Lives* are edited by Cobet (Paris, 1850, 1862).

DIOGENES OF AP'OLLO'NIA. A Greek philosopher, a pupil of Anaximenes and a contemporary of Anaxagoras, who flourished in Athens in the first half of the fifth century B.C. He believed air to be the source of all being, and all other substances to be derived from it by condensation and rarefaction. He also recognized an intelligent principle, but did not distinguish between mind and matter. Consult Zeller, *Philosophie der Griechen*, vol. i. (Leipzig, 1892).

DIOGENES CRAB. See HERMIT-CRAB.

DI'OGE'NIA'NUS (Lat., from Gk. Διογενειανός, *Diogeneianos*). A Greek grammarian of Heraclea, who lived in the middle of the second century A.D. His epitome, in five books, of the collection of glosses compiled by the Alexandrian grammarian Pamphilus, about a century before, is believed to have been the basis of the lexicon of Hesychius. A portion of the work, containing a collection of proverbs made by him, is preserved in an abridged form in the *Parœmiographi Græci*, edited by von Leutsch and Schneidewin.

DI'OGNE'TUS (Lat., from Gk. Διόγνητος), EPISTLE TO. A Greek Christian work, of unknown authorship, commonly included among the Apostolic Fathers (q.v.), but properly belonging to the apologetic literature of the early Church. In the Strassburg manuscript, our sole authority for the text, which was destroyed by fire in 1870, the work was attributed to Justin, but it is improbable that he was its author. The lack of external testimony to the Epistle renders the question of its date a difficult one. If we could be sure that the "Diognetus," to whom it is addressed, was the teacher of Marcus Aurelius, the problem would be easier. But of this we are by no means certain. Some extreme critics have conjectured that the work is a fifteenth-century forgery. Others, with much greater probability, assign it to the second, or the early part of the third century. In view of internal resemblances, some have inclined to the opinion that it proceeds from the same author as the recently recovered Apology of Aristides, which was written before A.D. 150. Date and authorship, however, remain matters of conjecture. The last two chapters are evidently a later addition, and from a different hand.

The Epistle is an excellent product of Christian thought and writing, evangelical in character, dignified in tone, and clothed in language which is at times almost of poetic beauty. Its contents are determined by the questions Diognetus has asked, e.g. what god the Christians worship, why they despise death, what is the explanation of their mutual love, and why their new life-motive did not sooner enter the world. In replying to these inquiries, the author shows special familiarity with Pauline and Johannine teaching. He sets forth Christianity on its practical side, placing emphasis upon godly living rather than upon correct dogmatic belief. Yet he combats with vigor the errors of the Jews and Greeks, very much after the fashion of the Apology of Aristides, arguing for the superior rationality of the Christian faith.

For the Greek text, consult: K. Otto, *Corpus Apologetarum Christianorum*, ii. (3d ed., Jena, 1879); for the text with Eng. trans., Lightfoot, *The Apostolic Fathers* (London, 1893); for Eng. trans., A. C. Coxe, *The Ante-Nicene Fathers*, i. Consult also, in general: G. Krüger, *History of Early Christian Literature* (trans. New York, 1897); the article "Diognetus," in Smith and Wace, *Dictionary of Christian Biography;* Harnack, *Chronologie der altchristlichen Litteratur*, i. (Leipzig, 1897).

DI'OMEDE ISLANDS. A group of three small islands situated near the middle of Bering Strait, in about latitude 66° N. and longitude 169° W., forming as it were stepping-stones between the nearest points of Asia and North America. They were discovered by Bering in 1728.

DI'OME'DES (Lat., from Gk. Διομήδης). The son of Tydeus and Deïpyle, and King of Argos. He plays a prominent part in the legend of the Trojan War, where he appears as the companion of Odysseus in many adventures, such as the bringing of Achilles from Scyros, the carrying off of the horses of Rhesus, and the theft of the Palladium. He is also prominent at the funeral games of Patroclus, where he is victor in the chariot race, and in the capture of Troy. Returning to Argos, he found that Aphrodite, in revenge for the wound which he had given her in a battle before Troy, had caused his wife to become unfaithful. In grief he left Argos, and, according to the later tradition, went to Italy, where he was honored in a number of the southern cities, as Metapontum and Thurii. Arpi in Apulia, Canusium, Brundisium, and several other towns claimed him as their founder. According to one story Athena gave him immortality; according to another, he was killed by the Italian King Daunus.

DIOMEDES. In Greek legend, the son of Mars and Cyrene, and King of the Bistones in Thrace. He fed his mares upon the flesh of strangers, until Heracles slew him and brought his mares to Eurystheus. According to one story, Heracles threw him to his mares to be devoured.

DIOMEDES. A Roman grammarian of the fourth century A.D.; author of *Ars Grammatica*, an extant treatise on grammar. The work, which is in three books, is founded on the same sources as the *Institutiones Grammaticæ* of Charisius, and is valuable chiefly for its quotations from earlier authorities now lost and for its comments on literary history contained in the third book and borrowed from the *De Poetis* of Suetonius. The text is printed in Keil's edition of the *Grammatici Latini* (i. 298). On Diomedes's Latinity, consult Paucker's treatise (Berlin, 1883).

DIOMEDES, VILLA OF. The name given to one of the villas at Pompeii excavated in 1771-74, and so called from the tomb of Marcus Arrius Diomedes, which faces it on the opposite side of the Street of Tombs. It was an extensive and very completely appointed establishment, built apparently before the time of Augustus. The rear portion occupies a lower level than the front and contains a colonnade surrounding a garden. In the wine-cellar beneath the colonnade twenty skeletons were discovered in the course of the excavation, and fourteen in other parts of the house.

DI'ON. (1) A Sicilian noble in Shakespeare's *Winter's Tale.* (2) Father to Euphrasia in Beaumont and Fletcher's *Philaster.*

DION (Lat., from Gk. Δίων) (c.410-354 B.C.). A Syracusan, son of Hipparinus, the brother-in-law of Dionysius the Elder, and a pupil of Plato. His lofty character secured for him the hostility of the King, Dionysius the Younger, and in B.C. 366 he was banished. His property was confiscated, and his wife, Arete, was given to another man. Dion retired to Athens, where he lived several years, but, desiring to free his country from the tyrant's rule, he in B.C. 356 returned to Syracuse with a small force. He took the city and expelled Dionysius, but was himself shortly after compelled to give up his power and withdraw to Italy. Being soon recalled by popular vote, he was assassinated about B.C. 354 by one Calippus.

DI'ONÆ'A (Lat., fem. of *Dionæus*, pertaining to *Dione*, Gk. Διώνη, *Diōnē*, name of Venus). A most remarkable insect-catching plant belonging to the order Droseraceæ. The single species, *Dionæa muscipula*, is popularly known as Venus's fly-trap because of the peculiarly trap-like fly-catching organ developed at the summits of its leaves. This plant is a small, relatively inconspicuous, perennial herb, growing native in bogs in North and South Carolina, and because of its interesting habits often kept in greenhouses. From the midst of the circlet of root-leaves arises a slender scape ten to twelve inches in height, at the summit of which is a cyme of small white flowers. The leaf is divided into two parts, a lower, simple, spatulate portion, above which, and separated by a narrow restriction, is the fly-trap. This organ forms the bilobed upper portion of the leaf, each lobe of which is reniform, with the edge provided with spiny bristles. The lobes hinge upon the midrib and have upon their inner surfaces a few extremely sensitive hairs. When these hairs are irritated by an insect the lobes, under favorable conditions of temperature, suddenly close, the marginal spines catching the insect after the manner of a steel trap. If the insect is caught the trap remains closed and, by means of secretions from the glandular inner surface of the lobes, the soft parts of the insect are digested and elaborated as food for the plant. After digestion and absorption, which may occupy two or three weeks, have been completed the trap opens and only the chitinous skeleton of the insect remains. If the insect is not caught the trap opens within an hour or so and is ready for the next trespasser. A single leaf seems to be capable of digesting only a few insects, after which its vigor diminishes; it responds less actively to excitation of the glandular surface and soon dries up or decays. Consult Darwin, *Insectivorous Plants* (New York, 1892).

DIONE, dī-ō′nē (Lat., from Gk. *Διώνη*). A Titan who became by Zeus the mother of Aphrodite, who is therefore sometimes called Dionæa. John Gay wrote a pastoral drama under this title (1720).

DIONYSIA, dī′ō-nĭsh′ĭ-ȧ. See GREEK FESTIVALS.

DI′ONYSI′ACA (Lat., from Gk. *Διονυσιακά*, *Dionysiaka*). A long epic in forty-eight books, by the Greek poet Nonnus, of Panopolis in Egypt, dating probably from the fifth century B.C. It recounts the journeyings of Dionysus in the East, and is one of the chief sources for the legends concerning the god.

DIONYSIUS, dī′ō-nĭsh′ĭ-ŭs (Lat., from Gk. *Διονύσιος*, *Dionysios*), surnamed THRAX ('the Thracian'). A Greek grammarian, native of Alexandria, who taught at Rhodes and at Rome in the first century B.C. His *Art of Grammar* (*Τέχνη Γραμματική*) is the foundation of all subsequent European works on grammar. The best edition is that of Uhlig (Leipzig, 1884).

DIONYSIUS, or **DINIZ,** dē-nēz′ (1261-1325). The sixth King of Portugal. He was the son of Alfonso III. of Portugal, and the grandson of Alfonso X. of Castile, and was born October 9, 1261. He succeeded his father in 1279, and after some difficulty effected a compromise with the Pope regarding the privileges of the clergy. In 1299 Dionysius's brother rebelled, but was soon subdued. Later Dionysius's son, jealous of a favorite, raised the standard of rebellion. By the intercession of the Queen-mother, Isabel of Aragon (afterwards canonized), war was avoided, and the son was allowed to exercise a powerful influence over the policy of the Government. The reign of Dionysius was a period of reform. The administration of civil and criminal justice was changed and the power of the great lords curbed. Industry and commerce were fostered; the mines were made a fruitful source of revenue, and fortifications were built in more than forty places. About 1288 a university was founded at Lisbon, which in 1308 was transferred to Coimbra. The military Order of Christ, founded in this reign, was endowed with the confiscated property of the Templars. Dionysius was one of the most liberal princes of his time, and won the title of the 'father of his country.' He died January 7, 1325.

DIONYSIUS OF AL′EXAN′DRIA, SAINT, called the Great (?-265). An early Christian writer. He was born at Alexandria of a noble pagan family, but was an early convert to Christianity, and under the tutelage of Origen became a priest, and head of the Alexandrian catechetical school in 231. In 248 he became Bishop of Alexandria, but continued to hold his former position. In the persecution of Decius (250) he was arrested and condemned to death, but was rescued by peasants, and remained concealed for a year in the Libyan desert. In 257 he was again exiled, but restored three years later. Most of his works are lost. Such as remain are in Migne, *Patrol. Græca*, x.; Engl. trans. in *Ante-Nicene Fathers*, vi. Consult: Förster, *De Doctrina et Sententiis Dionysii Magni* (Berlin, 1865); and for his biography, Dittrich (Freiburg, 1867), Paul Morize (Paris, 1881), and *Letters and Other Remains;* ed. by Feltoe (New York, 1905).

DIONYSIUS OF HAL′ICARNAS′SUS. A learned critic, antiquarian, and rhetorician. He was the son of one Alexander of Halicarnassus, and was born probably about the middle of the first century B.C. He came to Rome at the termination of the civil wars (B.C. 29), and resided there for twenty-two years, familiarizing himself with the language, literature, and antiquities of the Romans. His death occurred shortly after B.C. 7. Dionysius's most valuable work is unquestionably his *Antiquities of Rome,* although it does not exhibit the finest qualities of his mind. The author was an admirable rhetorician, but had very little political discrimination, and no perception of the difference between a myth and a historic fact. Yet, inasmuch as this work contains a mine of information about the constitution, religion, history, laws, and private life of the Romans, it will always command the regard of scholars. Of the twenty books of which it originally consisted, we possess only the first nine in a complete form, the tenth and eleventh nearly so; and of the rest, only a few fragments. The first edition of the Greek original was that by Stephens (Paris, 1546), but a very good Latin version was published as early as 1480. Angelo Mai published (Milan, 1816) a collection of the fragments of the lost books from a MS. in the library at Milan, the genuineness of which has been doubted. The rhetorical and critical works of Dionysius are of the highest literary merit. The principal are his *Censura Veterum Scriptorum*, his *Ars Rhetorica*, and his *De Compositione Verborum*, all in Greek. The complete works are edited by Usener and Rademacher (Leipzig, 1899); a good edition of the *Antiquities* is that of Jacoby (Leipzig, 1885).

DIONYSIUS THE AR′EOP′AGITE. A member of the Court of Areopagus (q.v.), at Athens, converted to Christianity through the preaching of Paul (Acts xvii. 34). Nothing more is known about him. Eusebius, on the authority of Dionysius, Bishop of Corinth, about A.D. 175, records that he was the first Bishop of the Church of Athens, and a much later historian says he was martyred there in the reign of Domitian. According to still another tradition, he was sent by Clement of Rome into Gaul (Paris), where he died a martyr on Montmartre. There is evident confusion between the real Dionysius and Saint Denis (q.v.), patron saint of France, who, according to Gregory of Tours, founded the Church in Paris in the third century. For this confusion the abbot Hilduin is largely responsible.

In the sixth century we meet with a body of writings which bear the name of Dionysius Areopagita. Ecclesiastical tradition ascribed them to Paul's Athenian convert, but it is certain that they are the work of a Christian Neo-Platonist of the sixth century. The first of these works, entitled *The Celestial Hierarchy,* deals with the nine orders of angelic beings; the second, *The Ecclesiastical Hierarchy,* with their nine earthly counterparts. Heaven and earth are thus woven together into one grand structure of correspondencies, suggesting the later system worked out by Swedenborg (q.v.). Through these graded hierarchies God communicates Himself to man. The treatise on *Divine Names* inquires what the names which have been given to the Deity can teach us respecting His nature and attributes. In the *Mystic Theology* the author transcends the system of symbols which he has hitherto employed, and sets forth an intuitive mysticism, the soul's rapture to the divine. It is here especially that, through the pseudo-Dionysius, Neo-Platonic and Christian mystics are brought into one line of historical development, for it can be shown that our author drew largely from Plotinus and Proclus.

The pseudo-Dionysiac writings were probably produced in the East. Syria and Egypt have been conjectured to have been their home. Their influence appears in the system of the great doctor of the Eastern Church, John of Damascus. In the West they are not found prior to Gregory the Great (sixth century), but throughout the Middle Ages they exerted a vast influence upon the thought of Christian Europe. In the ninth century Hilduin, abbot of Saint-Denis, wrote a life of Dionysius which gained wide currency, and not long afterwards, in the reign of Charles the Bald, the learned John Scotus Erigena translated his supposed works into Latin. In this more accessible form they furnished a prolific source of inspiration to the scholastic theologians, especially Hugues de Saint-Victor and Thomas Aquinas. The Florentine Platonists of the fifteenth century studied them with ardor, as did the English Humanists, Colet and Grocyn. Their influence is plainly traceable in Dante's *Divine Comedy.* Laurentius Valla and Erasmus cast doubt upon the prevalent belief that these writings were from the pen of the Athenian Dionysius, but their authenticity was stoutly defended by many writers, and is still maintained here and there, in spite of the overwhelming evidence to the contrary.

The works of pseudo-Dionysius were edited by Corderius, and reprinted in Migne, *Patrol. Græc.,* iii. and iv. (Paris, 1857). An edition of the *De Cœlesti seu Angelica Hierarchia* appeared at Freiburg, 1902. For an English translation, consult J. Parker, *The Works of Dionysius the Areopagite* (London, 1897); also, in general, the article "Dionysius," in Smith and Wace, *Dictionary of Christian Biography* (London, 1877-87); and Hugo Koch, *Pseudo-Dionysius Areopagita in seinen Beziehungen zum Neuplatonismus und Mysterienwesen* (Mainz, 1900).

DIONYSIUS THE ELDER (B.C. 431-367). Tyrant of Syracuse. He was born in a private station, and began life as a clerk in a public office. He fought with distinction against the Carthaginians, with whom the Syracusans had been at war since B.C. 410. After the loss of Agrigentum through the failure of the Syracusan generals to relieve the town, he came forward as the accuser of the commanders, and succeeded in securing the appointment of other officers, of whom he was himself one. He soon, however, supplanted his colleagues, and made himself tyrant of the city. This was in B.C. 406. He had already provided himself with a bodyguard of 1000 men, and he now strengthened his position by marrying the daughter of Hermocrates, the leader of the aristocratic party. The time from this latter event to B.C. 397, when the next war with Carthage began, he employed in still further strengthening and extending his power in Sicily. In the new war with Carthage he was at first successful in his operations, but when, in B.C. 396, fresh troops were sent to the island, he found himself blockaded in Syracuse and in serious danger of being deprived of his power. But, a pestilence breaking out in the Carthaginian fleet, the tyrant seized the opportunity to surprise the enemy's fleet and army. He was shrewd enough, however, not to push his advantage too far, and turned his attention next to those Greeks, especially the Greeks in lower Italy, who were still independent. In B.C. 392 he was interrupted in his plans by a renewal of hostilities on the part of the Carthaginians, but this struggle was soon terminated by a peace, in which Carthage recognized the tyrant as ruler of a large part of eastern Sicily. He now once more turned to lower Italy, and in B.C. 387, after a siege of eleven months, captured Rhegium. Thus the whole southern corner of Italy came under his rule. In B.C. 383, and again in B.C. 379, he found himself in his last conflict with the Carthaginians, who on both occasions tried to attack him by way of lower Italy. From this time till his death in B.C. 367, he ruled without opposition. His influence was great throughout the Grecian world. In B.C. 373 he assisted the Spartans against the Athenians, in B.C. 369 he supported the Thebans, who were then invading the Peloponnesus, and in B.C. 368 his troops took part in the Tearless Battle on the side of Sparta. As a ruler, Dionysius was cruel and unscrupulous. He did much, however, for the material prosperity of Syracuse, which under his rule became the most brilliant of Grecian cities. He sent deputies to the Olympic games, and himself contended for the prize of tragedy at Athens, receiving in B.C. 367 the first prize for a tragedy called *The Ransom of Hector.* He aimed also to have a literary court, and attracted thereto at different times the lyric poet Philoxenus, the philosopher Aristippus, and Plato. Consult: Holm, *Geschichte Siciliens,* vol. ii. (Leipzig, 1874); Grote, *History of Greece* (vols. x., xi. London, 1852-53); and Freeman, *History of Sicily* (vols. iii. iv., Oxford, 1891-94).

DIONYSIUS THE YOUNGER. Tyrant of Syracuse after the death of his father, Dionysius the Elder, in B.C. 367. He began his rule peacefully, at the age of twenty-eight, but, having been from motives of jealousy neglected by his father, he was entirely unfitted for his position. His kinsman, Dion, conceived the idea of improving him by putting him under the instruction of Plato, but the influence of the historian Philistus proved to be stronger than that of Plato; Dion was sent into exile, Plato was dismissed, and Dionysius encouraged to pursue a course of pleasure. Afterwards Plato was recalled to Syracuse, with even worse results. In B.C. 356 Dion returned to Syracuse at the head of a force of mercenaries, and Dionysius was obliged to leave Sicily. He retired to Locri in Italy, the birthplace of his mother, Doris, and ruled there despotically until B.C. 346, when he once more obtained possession of the Government at Syracuse. His rule was so oppressive that the Syracusans finally sought aid of Corinth, and Timoleon was sent to their assistance. Dionysius was shut up in the citadel of Syracuse and compelled to surrender B.C. 343. He was taken to Corinth, where he remained till his death.

DIONYSIUS, Ear of. The name given to one of the Lantumiæ or quarries of Syracuse, said to have been constructed by Dionysius the Elder. The cavern is so arranged that all sounds in it converged to one point, where Dionysius was said to have a secret chamber, in which he could overhear the conversation of the prisoners confined in the quarries. Though the cavern is partially filled up, it still possesses remarkable acoustic properties.

DIONYSIUS, Saint, Pope, 259-69. He was a Greek by birth, and must have been among the most distinguished members of the Church in Rome, even before his elevation, as his distinguished namesake of Alexandria addressed to him the fourth of his letters on baptism: afterwards the teaching of the latter on the Trinity was reviewed by him in a synod held in 262, and was the occasion of a notable letter to the Egyptian churches. His day in the calendar is December 26.

DIONYSIUS EXIG'UUS (Lat., Dionysius the Little). A learned monastic who lived in the fifth and sixth centuries. The epithet of *Exiguus* is merely a term of humility, used by Dionysius himself. Cassiodorus (q.v.), who was his fellow pupil, says that Dionysius was "a Scythian by birth, but wholly Roman in other respects." He made a collection containing (1) the first fifty canons of the Apostles; (2) the canons of ten councils; (3) thirty-eight decretals of the popes, from 384 to 498. This collection, of which there were two redactions, had great authority in the West. Somewhat changed, it was solemnly promulgated by Charles the Great in 802. (See Canon Law.) Dionysius completed the paschal cycle and introduced the custom of counting the years from the birth of Christ. (See Chronology.) He died before 555. Various works of Dionysius are printed in Migne's *Patrologiæ Latinæ Cursus Completus*, vol. lxvii. But this, as well as the earlier editions, is uncritical and incomplete. Consult Tardif, *Histoire des sources du droit canonique* (Paris, 1887).

DIONYSIUS PER'IEGE'TES (Lat., from Gk. *Διονύσιος Περιηγητής*). A Greek geographer, author of a Greek poem in 1187 hexameters, entitled *Τῆς Γῆς Οικουμένης Περιήγησις*, *A Description of the Habitable World*. The time and place of his birth are not known. It is probable, however, that he was a native of Charax, in Susiana, and lived in the latter part of the third or the beginning of the fourth century, A.D. His work enjoyed a wide popularity in ancient times, and was translated into Latin by Rufus Festus Avienus and by Priscianus. A Greek paraphrase and scholia and a valuable commentary upon it by Eustachius are still extant. The best editions of the *Periegesis* are those by Bernhardy in *Geographi Græci Minores*, vol. i. (Leipzig, 1828); and by Müller, in *Geographi Græci Minores*, vol. ii. (Paris, 1861).

DI'ONY'SUS. See Bacchus.

DIONYSUS, Theatre of. The oldest known theatre in the world, on the slope of the Acropolis at Athens. It has been the scene of excavations by the German Archæological Institute since 1886. The results of the researches show that, contrary to previously accepted belief, no permanent building for dramatic representations had existed on the spot until about B.C. 330, when Lycurgus erected a wall with wings to support temporary wooden decorations, and stone seats were provided for the audience. Later changes were made in the stage, but the existing ruins still leave the vexed question of its arrangement in doubt.

DI'ONY'ZA. The wife of Cleon, Governor of Tharsus, in Shakespeare's *Pericles*. In the epilogue, it is announced that she, her husband, and her house have been burned by the populace, angry at her attempt upon the child of Pericles.

DIOON, dī-ō'ŏn. See Cycadaceæ.

DI'OPHAN'TINE ANALYSIS. That portion of the theory of indeterminate problems which seeks rational and commensurable roots of equations involving the squares and cubes of the unknown quantity. This class of problems was first and chiefly treated by Diophantus, whose name the method bears. Although Diophantus gave problems involving the indeterminate linear equations, he was chiefly interested in solving equations of the second degree: e. g. to find two whole numbers, the sum of whose squares is a square; or to find three square numbers in arithmetic progression. The method of Diophantus, being neither concise nor definite, does not admit of a brief exposition. The following are, however, some of its characteristics: (1) His quantitative symbolism was limited to that of one unknown. (2) His rules of operation are the common axioms of adding to and subtracting from both members of an equation. (3) He showed much adroitness in selecting the unknown; e.g. so as to avoid affected quadratics or complete cubics. (4) He also showed skill in his tentative assumptions, in assigning separately to the unknown preliminary values which satisfy one or two only of the necessary conditions; then, from its failure to satisfy the remaining conditions, he discovered the required number, a method somewhat analogous to the *regula falsi* (q.v.). (5) He used the symbol for the unknown in different senses, which amounted to the same thing as substituting one unknown for a function of another. (6) He made some use of limits: e. g. to find a square between 10 and 11, Diophantus proceeds thus: No square lies between 40 and 44, nor between 90 and 99, but 169 lies between 160 and 176. These numbers being 16 times 10 and 11, respectively, the square between 10 and 11 is $\frac{169}{16}$. (7) He developed the use of synthesis (q.v.). (8) He showed skill in the introduction of arbitrary conditions: e. g. two numbers being sought such that the cube of one is greater by 2 than the square of the other, Diophantus arbitrarily assumes that the numbers are $x + 1$, $x - 1$. The strength of this analysis does not consist in the elegance and definiteness of the method, but in the consummate skill with which Diophantus makes use of the above devices. Diophantus's name is also associated with the following theorem: The sum of the squares of any three integers can never be expressed as the sum of two such squares. Fermat first proved this theorem and added the corollary: It is impossible that any multiple of a prime of the form $4n—1$, by a number prime to it, can either be a square or the sum of two squares, integral or fractional.

DIOPHANTINE THEOREM. See DIOPHANTINE ANALYSIS.

DI'OPHAN'TUS (Lat., from Gk. Διόφαντος). A Greek mathematician, who lived at Alexandria probably in the second half of the third century. He is called the Father of Algebra. He occupied himself chiefly with a class of problems discussed under DIOPHANTINE ANALYSIS (q.v.). Of his three works, (1) on *arithmetic*, (2) on *polygonal numbers*, (3) the *porisms*, the *Arithmetica* consisted originally of thirteen books, only six of which are extant. The polygonal numbers may have been one book of the *Arithmetica*, and the *Porismata*, which is lost, may also have been part of it. The best-known editions of Diophantus's works are those of Bachet de Mézeriac (Paris, 1621); Schultz (Berlin, 1822); and Tannery (Leipzig, 1893-95). Consult: Gow, *History of Greek Mathematics* (Cambridge, 1884); Nesselmann, *Geschichte der Algebra der Griechen* (Berlin, 1842); Heath, *Diophantos of Alexandria* (London, 1885).

DIOPSIDE (Gk. δίοψις, *diopsis*, view through, from διά, *dia*, through + ὄψις, *opsis*, view). A variety of pyroxene that crystallizes in the monoclinic system, and is essentially a calcium magnesium silicate. It is usually white or light gray, yellow, or green in color, although sometimes, owing to the presence of iron, it is dark green and nearly black. Diopside is a common mineral occurring in crystalline limestone and dolomite, in serpentine or igneous rocks. Transparent, oily, green crystals, especially those from Saint Lawrence County, N. Y., have been found sufficiently large and clear to be cut into gems weighing from 6 to 8 carats each. A variety containing chromium that is deep emerald green in color has been found of sufficient size for small gems.

DIOPTASE. A basic copper silicate crystallizing in hexagonal forms and of a bright green color and vitreous lustre. It occurs in Siberia, Hungary, Chile, and at the copper mines of Clifton, Ariz.

DIOPTOMETER (Lat. *dioptra*, Gk. διόπτρα, leveling instrument, from διά, *dia*, through + ὀπτ-, *opt-*, visual + μέτρον, *metron*, measure). An instrument used by oculists and opticians in measuring directly the curvature and focal length of glasses used to correct defective vision. It is based on the principle that the focal length of lenses of the glass usually employed is very nearly equivalent to one-half the sums of the radii of curvature. This follows from the formula that $\frac{1}{f} = (\mu - 1)\,\frac{1}{r} + \frac{1}{s}$, where f is the principal focus, μ is the index of refraction, and r and s are the radii of curvature of the two surfaces. As μ is approximately 1.5, it will be seen readily how easily the focal length can be obtained when once the two radii of curvature are known. The dioptometer is a simple arrangement of levers by means of which the curvature of any spherical surface is indicated, and the result shown in diopters. If the lens is plane, convex, or concave, the focal length is obtained directly by inspection, but if both surfaces of the lens are curved, the algebraical sum of the two readings must be taken.

DIOPTER, DIOPTRIC SCALE. The unit adopted by ophthalmologists in measuring the strength of lenses used in the correction of defective vision. A concave or convex lens with a focal length of one meter is taken as the unit, and the reciprocals of the focal lengths supply the numbers which are assigned to the lenses. Thus a lens with a focal length of .5 meter would be designated as Number 2, and one with a focal length of .1 would be a Number 10. The measures are the same whether the lenses are positive (convex) or negative (concave), but in the former case the + sign is prefixed to the number, while in the latter it is the — sign.

DIOPTRICS. That branch of optics which deals with the refraction of light. See LIGHT.

DI'ORITE (from Gk. διορίζειν, *diorizein*, to distinguish, from διά, *dia*, through + ὁρίζειν *horizein*, to divide, from ὅρος, *horos*, boundary). An igneous rock of granitic texture, the essential constituent minerals of which are a lime-soda feldspar and either hornblende or dark mica, or both of these minerals. The average chemical composition of diorite is about as follows: Silica, 61 per cent.; alumina, 16 per cent.; ferric oxide, 3 per cent.; ferrous oxide, 5 per cent.; magnesia, 4 per cent.; lime, 6 per cent.; soda, 3 per cent.; potash, 2 per cent. Many rocks formerly classified as diorites are now by many writers separated because of peculiarities of texture and of manner of occurrence; e.g. kersantite, camptontite, aphanite, etc. In addition to lime-soda feldspar, hornblende, or mica, diorites may contain quartz, alkali feldspar, or augite, and other minerals in smaller quantities. According to the presence or absence of quartz, diorites are classified as quartz diorites or diorites proper. Each of these groups is subdivided into mica diorites, hornblende diorites, or augite diorites, according as mica, hornblende, or augite predominates among the darker minerals. Peculiarities of texture alone serve to distinguish quartz diorites from dacites (q.v.), and diorites from andesites (q.v.), the composition being essentially the same. Chemically, diorites differ from granites chiefly in containing less silica and potash and more lime, magnesia, and iron. Mineralogically, they are distinguished by the greater abundance of lime-soda feldspar and by the darker color, due to the greater abundance of mica and hornblende. Diorite is often quarried for use as a building-stone.

DI'OSCO'REA'CEÆ (Neo-Lat. nom. pl., named after the Greek physician and botanist Dioscorides). An order of monocotyledonous twining herbs and shrubs, with large tubers or rhizomes, of which the genus Dioscorea (see YAM) is the type. Some species bear aërial tubers in the axils of the leaves, as the air-potato, one of the species of yams. There are about nine genera and 200 known species. The flowers are small, regular, and usually diœcious. The fruit is a capsule or a berry. The most important plants of the order are the different species of Dioscorea, or yam, a number of which occur in the United States. Black bryony (*Tamus communis*) is a representative species in the European flora. *Testudinaria elephantipes*, a South African species, sometimes called elephant's-foot, and Hottentot's-bread (q.v.), has a large, fleshy rhizome, with a rough cracked bark, which is used as food by the Hottentots in times of scarcity. The chief genera are Dioscorea, Tamus, and Testudinaria.

DI′OSCOR′IDES (Lat., from Gk. *Διοσκορίδης*, *Dioskoridēs*), PEDANIUS. A Greek physician. He was a native of Anazarbus, in Cilicia, and flourished in the first or second century of the Christian era. He accompanied the Roman armies as physician through many countries, and collected a great store of information on plants. In his great work, *De Materia Medica*, he treats of all the medicinal substances then known, and their properties. Two spurious works, *Alexipharmaca* and *Theriaca*, assigned to him by Photius, are by a later Dioscorides of Alexandria. During fifteen centuries Dioscorides maintained undisputed authority in botany and in materia medica, an authority which he still holds among the Turks and Moors. The best edition is by Sprengel (Leipzig, 1829). The *De Materia Medica* was translated into Latin at an early date, and later into all the vulgar tongues of western Europe. There is also an Arabic translation.

DIOS′POLIS (Lat., from Gk. *Διόσπολις*, city of Zeus). A name applied to several cities of antiquity. For Diospolis in Palestine, see LYDDA; and for Egyptian cities of the same name, see THEBES.

DIOS′PYROS. See EBONY; PERSIMMON.

DIOTIMA, di′ō-tī′mȧ (Lat., from Gk. *Διοτίμα*). The Mantinean priestess in Plato's *Symposium*, who describes in figurative language the doctrine of Platonic love.

DIP (AS. *dyppan*, *dippan*, to dip, Goth. *daupjan*, OHG. *toufen*, Ger. *taufen*, to baptize, from AS. *dēop*, Icel. *djūpr*, Goth. *diups*, OHG. *tiof*, Ger. *tief*, Engl. *deep*). A term used by geologists to denote the inclination of rocks to a horizontal plane. Stratified and schistose rocks are seldom horizontal, and their dip may vary from a slight inclination to absolute verticality. The amount of dip (expressed in degrees) is measured by a clinometer (q.v.). When strata have been upraised into dome-shaped structures which have an outward slope in every direction from a central point the dip is called 'quâ-quâ-versal.'

DĪPAVANSA, dē′pȧ-vän′sȧ (Pāli *dīpa*, island + *vaṁsa*, lineage). The title given to the oldest chronicle history of the island of Ceylon. It is written in the Pāli language and dates from the fourth century of our era. An account is given in this old record of Buddha and the history of Buddhism in Ceylon down to the year A.D. 302. Like the other Ceylonese chronicle, the Mahāvansa (q.v.), to which it is akin, the Dīpavansa is based on an older source. A record is preserved in the scholiast on the Mahāvansa that King Dhātusena (A.D. 459-477) caused the Dīpavansa to be publicly read at an annual festival held in honor of Mahinda, the apostle who introduced Buddhism into Ceylon. The text of the Dīpavansa has been edited and translated by Oldenberg, *The Dīpavaṁsa; An Ancient Buddhist Historical Record* (London, 1870); Geiger, *Dīpavaṁsa und Mahāvaṁsa* (Erlangen, 1901).

DIPHTHE′RIA, or **DIPH′THERI′TIS** (Neo-Lat., from Gk. *διφθέρα*, *diphthera*, leather). An acute infectious and very dangerous disease, caused by the Klebs-Löffler bacillus. It is characterized by an inflamed throat in which a false membrane appears on the mucous membrane in patches, generally first on the tonsils, and then extending down to the larynx, up into the nasal passages, and into the mouth. It also appears on other mucous surfaces and upon any ulcer that may exist elsewhere. The false membrane is formed of lymph, which exudes upon the surface, together with mucus, pus, and the bacilli named. The mucous membrane is congested and swollen, and if the diphtheritic exudation be rubbed off, bleeding occurs, and the spot is very tender. The patient is very weak and depressed, suffers from fever, thirst, nervousness, insomnia, and loss of appetite. The throat is painful and the glands in the neighborhood swell and are tender. Meningitis and Bright's disease frequently accompany diphtheria, and paralysis is a frequent occurrence during or a few weeks after the attack. The diagnosis of the disease is not always easy, and suspicious cases of tonsilitis are quarantined, as are all cases of undoubted diphtheria, till cultures made with mucus from the neighborhood of the tonsils have been examined microscopically for the bacilli of the disease. Besides separating the patient from the rest of the family by removing him to an upper room, from which carpets, upholstered furniture, and all cloth hangings have been removed, provision must be made for the nurse, so that she may change her clothing and disinfect her face, hair, and hands, before passing through the house for her daily airing out of doors. Quinine, mercury, iron, chlorate of potash, and alcoholic stimulants are used by various physicians, though each is condemned by some. The hypodermic injection of diphtheria antitoxin, introduced in 1894, gives by far the best results, as stated hereafter.

HISTORY. It is believed that an epidemic disease which existed anterior to Hippocrates (c.460-360 B.C.) was diphtheria. The malady is described by Aretæus of Cappadocia (c.100 A.D.) under the names *Ulcus Syriacum* and *Malum Egypticum*. Perhaps the earliest modern treatise upon the disease was that by Hecker, descriptive of the epidemic which prevailed in Holland in 1337. In 1517 diphtheria of malignant type raged in Switzerland, along the Rhine, and in the Netherlands; in 1557 it was epidemic in France, Germany, Holland, and Spain. In 1659 it had reached the New England States in this country. In 1765 a Scotch physician, Home, endeavored to establish the fact that the pharyngeal disease now called diphtheria was different from croup. In 1771 Dr. Samuel Bard, of New York, opposed Home, in a controversy, publishing very important and accurate observations regarding the disease. The term 'putrid sore throat,' given to the disease by Dr. John Fothergill, of London, in 1745, remained the accepted name in English-speaking countries till, in 1821, Bretonneau, of Paris, published his admirable and extensive observations upon the disease and gave it its present name. Little advance was made in the knowledge of diphtheria after Bretonneau's treatises were put forth until the micro-organism of the disease was isolated.

MORTALITY. The control of diphtheria, which has been epidemic in this country since 1857, is largely due to the early treatment of the disease with diphtheria antitoxin, together with systematic isolation of cases. While occasional clinicians of experience and ability are found who actively antagonize the theory of, and deny the good results from, the use of antitoxin, the great and overwhelming mass of evidence in its favor continues to increase year by year. The diphtheria committee of the Clinical Society of London published in its report for 1898 the following results of inquiry into 633 genuine cases of diphtheria: The total mortality in these cases was 19.5 per cent. as opposed to 29.6 per cent. in the non-antitoxin control series, compiled before the introduction of antitoxin. In the tracheotomy cases the mortality amounted to 36 per cent., as opposed to 71.6 per cent. in the non-antitoxin series. Buchwald, of Munich, reported 57.72 per cent. of deaths in cases treated without antitoxin, 28.93 per cent. of those treated with antitoxin. Krönlein, of Zurich, reported to the Congress of German Surgeons in 1898 upon 1773 cases of diphtheria observed in the clinical hospitals of the university from 1881 to 1897. The mortality in the pre-antitoxin period was 39.9 per cent., against 12.5 per cent. in the antitoxin period. In the operation cases (including both tracheotomy and intubation cases), the mortality was 66.1 per cent. under the old régime, and 35.6 per cent. with antitoxin. In the cases upon which no operation was done, the mortality in the pre-antitoxin period was 14.2 per cent., against 5.6 per cent. under antitoxin. In all the 437 cases occurring in the antitoxin period the Klebs-Löffler bacillus was demonstrated. Dr. A. Jacobi, perhaps the most eminent clinical authority on the disease in New York, sums up the facts proved by Krönlein's statistics, as follows (*Twentieth Century Practice*, vol. xvii., New York, 1900): "While the morbidity of the whole district, city and country, remained unaltered in the antitoxin period, the mortality decreased considerably, and principally in the first years of life. While previously to the institution of the antitoxin treatment one-half of all the cases demanded operation, this percentage had fallen to 23.1 per cent. since that time." Dr. H. M. Biggs concludes from extensive experience and many researches made as pathologist of the Health Department of New York City, that "since the introduction of antitoxin treatment the mortality of diphtheria is reduced one-half; its course is shorter and milder; an injection made within the first two days of the disease reduces the mortality to 5 per cent., and the earlier the injection is made the better is the result. Small quantities of concentrated serum are tolerated by very young infants. If antitoxin is not a specific, it is certainly the best remedy in our possession against diphtheria. The genuine (that is, uncomplicated bacillary) cases are more amenable to its favorable influence than mixed infections. It has no secondary effects on the heart, kidneys, or nerves. Heart failure and paralysis, whenever observed, are caused by diphtheria, not by antitoxin."

BACTERIOLOGY AND PATHOLOGY. The bacillus which causes diphtheria was discovered in 1883 by Klebs, and in 1884 Löffler published the results of his careful study of the bacillus. Roux and Yersin added proof to the dependence of diphtheria upon this bacillus, and the names of the first discoverers have been given to the causative micro-organism. The bacillus is from 2.5 to 3 micromillimeters long and about one-fifth as wide. It varies in shape, being straight or slightly curved, with rounded, clubbed, or, more rarely, pointed extremities. One of its most marked peculiarities is that, when treated with Löffler's alkaline methylene-blue solution, it takes an irregular stain, being darker in some parts than in others. This peculiarity is extremely valuable in identifying the organism. Artificially the bacillus may be cultivated on bouillon, agar, or blood serum, but it grows most rapidly and luxuriantly on glucose broth serum (Löffler's blood serum mixture) at about body heat. Advantage is taken of this in determining its presence in doubtful cases. Thus, if a scraping from the membrane be rubbed over the surface with blood serum, and the tube containing the same be placed in an incubator for from twelve to sixteen hours, the Löffler bacillus, if present, so outstrips most other bacilli in growth, that a specimen examined with the microscope shows an almost pure culture of diphtheria bacilli. The bacillus is not motile, does not develop spores (see BACTERIA), can live for months in the dried condition, but is killed by exposure for ten minutes to 58° C., moist heat. Various other bacteria are often associated with the Löffler bacillus in diphtheria. Of these, the most common, and at the same time most important, is the *Streptococcus pyogenes*. This organism is probably responsible for the suppuration of the glands, for the broncho-pneumonia, and the general infection, which sometimes occur during the course of a diphtheria.

To the works of Weigert, Wagner, and Oertel we are indebted for much of our knowledge of the minute changes which take place in the formation of the diphtheritic membranes. The diphtheria bacilli or their poisons first induce necrosis of the more superficial cells. This is followed by a more extensive coagulation necrosis, with exudation, the whole forming the well-known false membrane. This membrane is most common on the mucous membrane of the tonsils and adjacent parts of the pharynx, but may extend to or involve any portion of the mucous membrane of the throat, mouth, or nose. Among the most fatal forms of diphtheria are those in which extensive membranous formation takes place in the nose or in the larynx, the latter sometimes called 'membranous croup.' (See CROUP.) Diphtheritic membranes are occasionally found on the conjunctiva, in the external auditory canal, the mucous membrane of the anus and genitals, and on wounds of the skin. Of lesions in other organs, broncho-pneumonia is not uncommon, and some cases are accompanied by acute parenchymatous nephritis. Of later effects, the most common and important is paralysis, a lesion of the nature of a multiple neuritis, due to the poison of the disease. The changes in the nerves are of a degenerative character, and quite similar to those found in neuritis (q.v.) from alcohol or other poisons.

Toxin and Antitoxin. The diphtheria toxin has been isolated by Roux, Yersin, Brieger, Fraenkel, and others, by filtration of cultures of the living bacilli through porous porcelain. It appears to be analogous to the poisons of certain venomous serpents. Behring (q.v.) announced his discovery of diphtheria antitoxin in 1890. He, Fraenkel, Wernicke, Aronson, Roux, and others succeeded in rendering animals immune to diphtheria by the use of inoculations of virulent or somewhat attenuated cultures of diphtheria toxin. W. H. Park, of New York, says (in *Twentieth Century Practice*): "The most important and valuable results are those which have been obtained by Behring, in conjunction with others, who showed that the blood of immune animals contains a substance which neutralizes the diphtheria toxin. The blood serum of persons who have recovered from diphtheria has also been found to possess this protective property, which it acquires about a week after the beginning of the disease, and loses again in a few months." To obtain antitoxin for therapeutic purposes, strong toxin obtained from virulent cultures of the Klebs-Löffler bacillus is injected into the bodies of young, healthy horses. At the end of two months, during which time increasing doses of the toxin have been given, blood is drawn from the horses and tested for antitoxin. That having sufficiently strong antitoxin is retained and the process of inoculating and of withdrawing serum is repeated for years, allowing three months of each year as an interval of freedom from inoculations. The serum obtained is sterilized by the addition of carbolic acid by some who prepare it, but Park considers the addition of any antiseptic as unnecessary and inadvisable. The antitoxic serum is used hypodermically as early as a diagnosis of diphtheria has been made, in dosage of from 600 to 2000 units, a unit being equivalent to one cubic centimeter of 'normal serum'; i.e. of blood serum of an immunized animal, which was made so efficacious that 0.1 cubic centimeter antagonizes ten times the minimum of diphtheria poison fatal to a guinea-pig weighing 300 grams, or about ten ounces (Jacobi, *Twentieth Century Practice*, vol. xvii., New York, 1900). See the article Antitoxin; Bacteria; Immunity; and Serum Therapy, and the various authorities referred to thereunder.

DIPHTHERIA (in Fowls). See Roup.

DIPHTHERIA (in Pigs). See Swine Plague.

DIPHTHONG (Lat. *diphthongus*, Gk. *δίφθογγος*, *diphthongos*, diphthong, from *δι-*, *di-*, double + *φθόγγος*, *phthongos*, sound, from *φθέγγεσθαι*, *phthengesthai*, to utter). A term used to denote two vowel sounds following one another so closely as to form but one syllable, as in *out*. In this combination the sound is really composed of an *a* as heard in *father*, and a *u* as heard in *put*. The spelling of the English has little or no relation to the pronunciation in this matter. In many syllables written with two vowels, only one sound is heard, as in *bread*. The single vowel letters, again, often represent a diphthongal sound; thus, the long sound of *i*, as it is called, is really composed of the sound of *a* as heard in *father* and that of *e* in *me*; and *tune* is pronounced as if written *teun*, or rather *tyun*. In such words as *bread*, *field*, the vowels, which are now monophthongs, were at one time real diphthongs, and are still so pronounced in many parts of England; on the other hand, many diphthongs in modern English are developed from original simple vowel sounds, or monophthongs; thus the *ou* in *mouse* is derived from the *ū* of old English *mūs*.

DIP′LOCOC′CUS. See Bacteria.

DIPLOD′OCUS (Neo-Lat., from Gk. *διπλόος*, *diploos*, double + *δοκός*, *dokos*, beam). A gigantic fossil reptile of the order Dinosauria, suborder Sauropoda, found in the Jurassic rocks of western North America. Its body was long and low, its head remarkably small, its neck very long, trunk short and deep, and the tail was very long and quite thick at the base. The legs were strongly built and of almost equal length, indicating quadrupedal locomotion, and the feet were armed with heavy claws. The skull was high and laterally compressed posteriorly, with a long sloping face, and with large orbits situated far back on the sides. The jaws had weak, slender, spreading teeth only in their anterior portions, all the premolars and molars being absent. The vertebræ of Diplodocus are of great interest because of the elaborate systems of plates and buttresses that give support to the vertebral processes and thus lend great strength without much increase of weight. The animal appears to have been herbivorous, and was probably aquatic, living in the extensive marshes and swamps of the Jurassic seas and lowlands that probably resembled those of the modern Amazon and Congo basins. Some figures, based upon the skeleton mounted in the Carnegie Museum at Pittsburg, express more clearly the immense proportions of this ancient reptile. The total length, from tip of nose to tip of tail, was about 60 feet, and its height was nearly 12 feet. The head was 2 feet long, only one-thirtieth of the length of the body, and the neck 20 feet in length. The trunk, from the point of the shoulder-blade to the middle of the sacrum, measured 13 feet, and had a depth of 7 to 8 feet, and the tail was at least 25 feet long. The animal is estimated to have weighed, when alive, about twenty tons, and to have required a daily meal of at least 500 pounds of vegetable food such as the twigs, leaves, and succulent stems of plants that grew in the waters of its habitat. Consult: Hatcher, "Diplodocus, Marsh, Its Osteology, Taxonomy, and Probable Habits," *Memoirs of the Carnegie Museum*, vol. i., No. 1 (Pittsburg, 1901); Lucas, *Animals of the Past* (New York, 1901). See Dinosauria.

DIP′LODUS. See Pleuracanthus.

DIP′LOGRAP′TUS. See Graptolite.

DIPLOMA (Lat., from Gk. *δίπλωμα*, folded paper, letter of recommendation, from *διπλόος*, *diploos*, double). A term used by the ancients especially to indicate letters of license received from the Government. It originated in the custom of writing such documents on two tablets of wax which were doubled, or on writing material which was folded. Subsequently the term was applied to all old imperial and ecclesiastical acts and grants, public treaties, deeds, letters, wills, and all similar instruments that were drawn up in a formal manner and marked with a seal or other peculiarities for identification. The term is now restricted, for the most part, to instruments given by universities, colleges, and other learned societies in proof of the holder's having attained a certain degree; or to the licenses held by professional persons as an essential qualification to the practice of their art. While the old legal significance of such diplomas has largely lost its force, they are yet required by the public as a protection from imposture and as an indication of some qualification in the art professed. In the United States there is a decided tendency toward bringing all such diploma-conferring bodies under the supervision and control of the State, thus putting them upon much the same plane that they occupy in Continental Europe. See CHARTERS; COLLEGES, AMERICAN; DEGREE; PALEOGRAPHY; UNIVERSITY.

DIPLOMACY. In the wider sense, the art or science of foreign politics. The term is, however, more commonly employed in the more restricted meaning of the art of managing the intercourse and adjusting the relations of States to one another by negotiation. Used in this sense, the word is of modern origin, dating back only to the latter part of the eighteenth century. The art and the processes connoted by the term, however, are as old as international relations, and cover the whole field of such relations, whether strictly political or not. The principal objects of diplomacy have always been the same—to preserve the independence and safeguard the security of the State, or to secure some coveted political advantage over other States. Subsidiary to these principal objects have been the more immediate purposes of preserving certain political arrangements—such as the European 'balance of power' —intended to prevent the aggrandizement of certain States at the expense of others, the prevention of general wars, and the securing of commercial advantages to the subjects of trading nations. Under settled political conditions, such as now exist in Europe and in North America, the commercial purposes of diplomacy tend to become more prominent than those of a purely political character, though the latter never lose their supreme importance, and are never far in the background of international intercourse.

The methods of diplomatic action vary according to the magnitude of the interests involved and the nature of the emergency which calls them into play. For the settlement of questions vitally affecting several States, or such as involve the peace of a continent, or the general policy of the great powers of Christendom, a general congress or international conference may be summoned. Of this character was the Congress of Westphalia, held in 1648 to settle the issues involved in the Thirty Years' War; the Congress of Vienna (1814-15), by which the problems arising out of the Napoleonic wars, were adjusted; the Hague Conference (1899), for the promotion of the peaceful settlement of international differences among all civilized States; and the Conference of Algeciras (1906) for the settling of relations between European powers and Morocco.

Questions of less general importance, arising among two or more States, are more frequently settled by formal treaties, directly negotiated by the regular diplomatic representatives of the States affected, though these may also be considered and the conflicting claims of the parties adjusted by joint commissions appointed for the purpose. Where these claims cannot be so adjusted by negotiation, resort may be had to a permanent tribunal of arbitration, like that established as the result of The Hague Conference above referred to, or to arbitrators agreed upon by the parties to the controversy. Matters of less importance, not requiring formal adjudication or the solemn sanction of a treaty, are commonly dealt with in informal conferences between the foreign offices of the States concerned, and these result in friendly understandings as to the policy to be pursued by them.

The management of the foreign intercourse of a nation is one of the chief functions of the executive head of the State. Formerly it was largely performed by the ruler in person, but it has in modern times passed into the hands of a class of officials known as diplomatic agents, though the most important of these, as ambassadors, are invested with an extraordinary degree of dignity, from the fact that they are supposed to represent the person of the sovereign, and not merely the foreign office of the State by which they are accredited. Under modern conditions, the usual instruments of diplomacy are: (1) The principal secretaries of State for foreign affairs; (2) regular diplomatic agents of various grades, ranging from ambassadors to *chargés d'affaires;* (3) occasional embassies or agents of diplomatic intercourse appointed for the accomplishment of a particular purpose. See DIPLOMATIC AGENTS.

Prior to the fifteenth century diplomatic intercourse was conducted almost entirely by ambassadors and other agents of the last-named class, and was as ineffective as its irregularity and lack of knowledge would lead us to expect. But with the establishment of resident legations in that century, the practice of diplomacy was raised to a fine art, which rapidly assumed commanding importance in European politics. At a period when international relations were based on personal and dynastic interests, and when statecraft was another name for intrigue, the rôle of the ambassador was second in importance only to that of the sovereign. Success in diplomacy turned largely upon the personal qualities of the ambassador, upon smooth and engaging manners, cunning, and astuteness, and was thus a matter of personal influence. Being beyond the reach of instructions, he occupied a position of great independence and power. There was no diplomatic profession, but the great posts in the service were sought after by the greatest persons in Church and State. The institution by all the great powers of a trained diplomatic service in the last century, and the astonishing improvement in methods of communication, especially in the use of the telegraph, have greatly impaired the power and importance of ambassadors, and have tended more and more to reduce them to the position of mere intermediaries, acting under instructions from the governments which they represent.

It may be doubted whether diplomacy can fairly be held responsible for the dishonorable methods with which the term has come to be associated. If it has at times been characterized by intrigue and deception, by the absence of large views and generous motives, by selfishness, and a disposition to sacrifice the interests of the weaker to the stronger, it has in these respects only too accurately reflected the statesmanship of its time. And that statesmanship was for centuries based on the perfectly just supposition that 'Europe was always in a state of war, overt or latent.' The gradual substitution of national for personal and dynastic interests, which the last century has witnessed, has at once given a more pacific character to international relations and a more straightforward and business-like tone to our diplomacy. Not that suspicion has entirely disappeared from the one, or deception from the other, but they have become the exception and not the rule.

The international relations of States with which diplomacy has to do are only those of a pacific character. With the outbreak of war diplomatic relations come to an end. The suspension of diplomatic intercourse is usually a preliminary to a declaration of war, though it is sometimes employed as a mild means of coercion of a weak State by a more powerful one. In such a case it may be regarded as a strong expression of displeasure, which may, if reparation be unduly delayed, result in the use of force.

The usage of the last three hundred years has resulted in the general adoption of French as the language of diplomatic intercourse in Europe. The recent tendency has been to confine this to oral intercourse, written instructions and other diplomatic dispatches being usually couched in the language of the Government employing and transmitting them.

The history of diplomacy is one of the most interesting and important chapters in the political history of nations. Its sources are to be found in treaties, in the correspondence of ministers of State and ambassadors, contained in the published and secret archives of States, and in the diaries and private correspondence of public officials and courtiers. For a further discussion see INTERNATIONAL LAW, and the authorities there referred to; also Moore, *A Hundred Years of American Diplomacy* (New York, 1900); id., *History and Digest of International Arbitrations* (Washington); id., *The Old Diplomacy and the New* (University of Virginia, 1899); id., *American Diplomacy* (New York, 1905); Hill, *History of European Diplomacy* (New York, 1905).

DIPLOMACY. An adaptation from Sardou's *Dora*, made by Bolton and Savile Rowe, and produced in 1878.

DIPLOMATIC AGENTS. In the widest sense, all the officers to whom the intercourse of the State with foreign powers is committed. As thus employed, the expression would include the Foreign Minister, or Secretary of State for Foreign Affairs, and, in the United States, the Senate in the exercise of its constitutional function of approving treaties with foreign States, as well as the regular and occasional representatives of the Government abroad. More properly, however, it has reference only to the latter class of officials, who, under instructions from the home Government, carry on its intercourse with the powers to which they are accredited. Attention has been called in the article on DIPLOMACY to the fact that for many centuries the diplomatic intercourse of States was carried on by occasional embassies, appointed for a particular purpose, and that it was not until the fifteenth century that permanent and continuous diplomatic relations were instituted by the establishment of resident embassies. By far the greater part of the international intercourse of the modern world is conducted through these regular diplomatic channels, though occasional embassies are still employed for special occasions, principally of a ceremonial character, and the Foreign Office, or Department of State, of one Government may, on occasion, communicate its views directly, by circular or otherwise, to the corresponding office of foreign States.

The transformation of diplomacy in the last century from the art of applying personal influence in the management of men, to the more prosaic and worthy art of managing the business of the State with foreign nations, has necessitated a corresponding change in the organization and character of the diplomatic service. The personal qualities of shrewdness, a talent for intrigue, and smoothness of address, on which the old diplomacy was based, declined in importance, and made way for the knowledge of international law, of history, of the laws and conditions of trade, of men and affairs, which the new diplomacy required. Accordingly the management of diplomatic intercourse has in Europe generally passed from the men of exceptional gifts or exceptional influence, selected at random for the service, to a professional class of trained diplomatic servants. The comparative isolation of the United States hitherto, and the simplicity of her foreign relations, have delayed the adoption of this reform in her diplomatic service, but the new conditions resulting from the war with Spain and her recent extraordinary commercial expansion indicate that a similar change in the character and organization of her diplomatic service cannot be much longer delayed.

Formerly the term ambassador was applied to all accredited diplomatic agents, and it is sometimes still employed, interchangeably with minister, as a general term to describe such agents of whatever rank. But the title is now strictly appropriate of only one, and that the highest class of diplomatic representatives. The process of classification began before the close of the seventeenth century, but did not receive international recognition until the beginning of the last century. In 1815 the eight principal powers represented at the Congress of Vienna agreed upon a gradation of diplomatic agents, who were thenceforth to rank as follows: (1) Ambassadors, legates and nuncios of the Pope; (2) envoys, ministers, and others accredited to the sovereign; (3) chargés d'affaires accredited to the department of foreign affairs. At the Congress of Aix-la-Chapelle a further distinction was made between ministers plenipotentiary, who were accorded the second place, and ministers resident, who became "an intermediate class between ministers of the second order and chargés d'affaires." As the rank of a foreign minister has nothing whatever to do with his power or with the facilities afforded him for transacting diplomatic business, or with the immunities enjoyed by him, but is a mere matter of precedence and the ceremony of courts, the United States long refused to recognize the classification of the European powers and accredited all of its principal diplomatic agents as ministers plenipotentiary, i.e. ministers of full power and authority. In 1893, however, the President was authorized by act of Congress to appoint ambassadors of full rank and of equal grade and dignity with those which should be accredited by foreign powers to this country. In accordance with this act the United States is now represented by ambassadors at the courts of England, Germany, Italy, Austria-Hungary, and Russia, and the Republics of France, Mexico, and Brazil. In addition to these regular diplomatic representatives, a State may also employ agents of an irregular and inferior sort who have a certain qualified diplomatic status, as officers in command of armed forces in foreign territory, commanders of ships of war, secret agents sent on diplomatic errands, commissioners for special objects, bearers of dispatches, and, under exceptional circumstances, consuls. All of these enjoy some of the privileges and immunities which attach to the exercise of the diplomatic office.

While it is not in general open to a State to refuse to receive a diplomatic agent from another power, it may, for special reasons, object to receive a particular individual in a diplomatic capacity. If, however, the grounds for such objection do not commend themselves to the State by whom the minister was accredited, it may, as a mark of its disapproval, leave the post vacant for a considerable time. An instance of this was the rejection in 1885 of a minister appointed by President Cleveland by the Italian and Austrian governments in succession. The grounds of the objection by Italy being satisfactory, another appointment was promptly made, but the Austrian objection being regarded as frivolous and unreasonable, the legation at Vienna was left in the hands of a chargé d'affaires. So, too, a State may, without giving international offense, request the withdrawal of a foreign minister who has rendered himself obnoxious to the Government to which he is accredited, or may even, in a serious case, peremptorily dismiss him. This was done in the case of Lord Sackville, the British Minister to the United States, who, on the eve of the Presidential election of 1888, in a private letter incautiously expressed himself on the question of the probable relations of the Government with Great Britain in the event of President Cleveland's reëlection. This diplomatic indiscretion, occurring in the heat of a Presidential campaign, was treated by the American Government as an open and intentional affront, and the offending minister dismissed without waiting for his recall by his Government. Obviously the right is one to be exercised with caution, in order to avoid giving offense to the State by whom the disgraced minister was accredited.

The distinction of the ambassadorial office, as the direct representative of a sovereign power, and the importance of the duties intrusted to it have combined to invest it with a peculiar sanctity. This has, in modern times, taken on the form of a privileged status, attended with certain immunities, which a foreign minister enjoys in the country to which he is accredited. These may be briefly enumerated as follows: (1) Exemption of the minister from the local jurisdiction, both civil and criminal. (2) Inviolability of his house, his papers, and goods from search and seizure. (3) Exemption of his personal effects from imposts and taxation. (4) Liberty of worship for himself and the members of his family and suite. (5) A qualified exemption of his family and train from the local jurisdiction. These immunities are generally referred to the principle of exterritoriality, the domestic jurisdiction of the minister being supposed, by a legal fiction, to go with him and to exclude the local jurisdiction of the State to which he is accredited. (See ASYLUM; EXTERRITORIALITY.) But in its modern form the doctrine is more properly explained on principles of convenience and international comity, the independence of the minister and the inviolability of his person, his family, and property being essential to the due performance of the high and important functions with which he is invested. The subject is fully treated in ancient and modern treatises on international law (q.v.). Consult: Hall, *Treatise on International Law* (4th ed., London, 1895); Woolsey, *Introduction to International Law* (6th ed., New York, 1891); Moore, *Digest of the International Law of the United States* (Washington, 1903).

DIPLOMATICS (from Lat. *diploma*, diploma). The science of ancient writings. The term is less used than the more convenient and descriptive term paleography (q.v.).

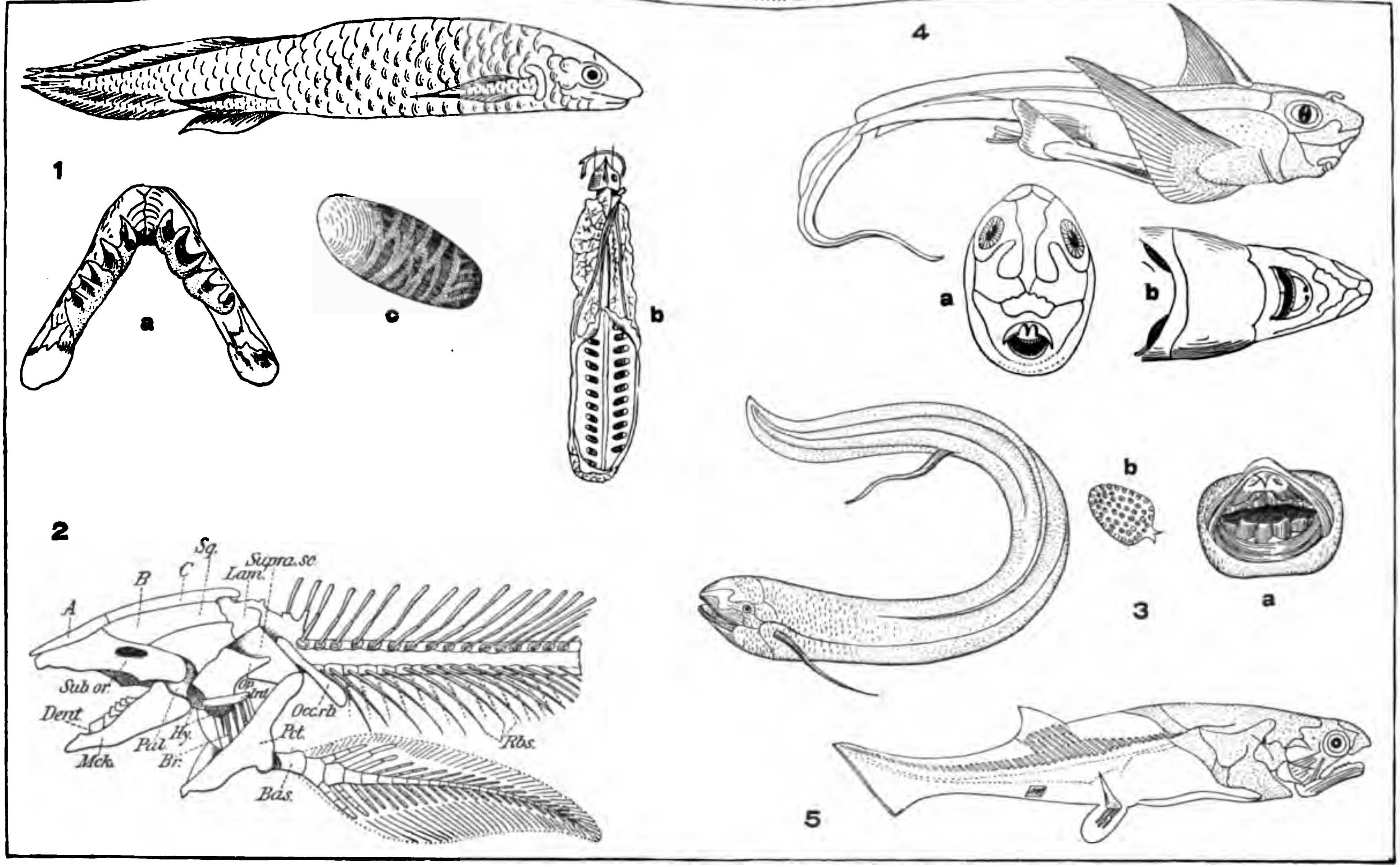
DIPLO'PIA. See SIGHT, DEFECTS OF.

DIPLOP'ODA. See CHILOGNATHA.

DIPH'ILUS (Lat., from Gk. Δίφιλος), of Sinope. An Attic poet, who flourished about B.C. 300; a contemporary of Meander. He is supposed to have written about one hundred comedies, of which the titles and fragments of about fifty are still extant. He frequently took his subjects from common life and mythology, so that, though in point of time they belonged to the new comedy, his works seem to have had more of the character of the Middle Period. The *Casina*, *Commorientes*, *Vidularia*, and *Rudens* of Plautus are modeled on plays of Diphilus, and Terence borrowed from his Συναποθνήσκοντες, in the *Adelphi*. The extant fragments of his works are collected in Meineke, *Fragmenta Comicorum Græcorum*, vols. i. and iv. (Berlin, 1839-57); and in Kock, *Comicorum Atticorum Fragmenta*, vol. ii. (Leipzig, 1884). These fragments, and the judgments passed on Diphilus in antiquity, have led to the belief that he was one of the most gifted poets of his age.

DIP'NOI (Neo-Lat. nom. pl., from Gk. δι-, *di-*, double + πνεῖν, *pnein*, to breathe, referring to their breathing through the gills and the lungs). The lung-fishes, a group of fishes, by some zoölogists regarded as forming an entirely separate class of vertebrates. They were more numerously represented in past ages than now, when their only living representatives are the genera Ceratodus (see BARRAMUNDA), Protopterus, and Lepidosiren (see MUDFISH). Their chief peculiarity is in the organs of respiration, since, in addition to piscine gills, they have either one or two lungs proper to breathing air. They have bony scales, but the skeleton is cartilaginous, and thus described by Parker and Haswell: "The notochord is persistent, and the cranium [see Plate] consists of a mass of cartilage with little ossification, but with the addition of a number of membrane bones, the skull is *autostylic*, the lower jaw articulating with a palatoquadrate process (*pal*), corresponding to the palato-quadrate of the dogfish, but immovably fixed to the side of the skull. There are four or five cartilaginous branchial arches. The gills are covered over by an operculum. The structure of the paired fins is on a totally different plan from that of any other living fish. The fin, pectoral or pelvic, as the case may be, is leaf-like, or very long and narrow, and the skeleton con-

DIPNOI AND CHIMÆRA



1. BARRAMUNDA (Ceratodus Fosteri): a, jaw and teeth; b, a lung, laid open; c, lung cell (enlarged).
2. DIPNOIAN SKELETON. (See article Dipnoi).
3. MUDFISH (Lepidosiren): a, mouth and teeth; b, a scale (enlarged).
4. CHIMÆRA: a, face; b, under side of head. (See article Chimæra).
5. BERRYBONE FISH (Coccosteus decipiens).

sists of a central axis in the form of a slender, tapering, jointed rod of cartilage, with a row of smaller jointed rods of cartilage on either side of it. This form of fin-skeleton, which occurs in certain groups of fossil fishes, as well as in Dipnoi, has been termed the archipterygium." In respect to the structure of the soft parts, it may be noted that a cloaca is present, and the intestine contains a spiral valve; the heart is more complicated and highly developed than in ordinary fishes, and a pulmonary artery and vein exist. The special interest in this group arises from the belief that it anciently gave rise to the class of amphibians. Consult: Cope, *Origin of the Fittest* (New York, 1886); id., *Batrachia of North America* (Washington, 1899); Gadow, *Amphibia* (London, 1901). See MUDFISH; STEGOCEPHALIA; and Plate of DIPNOI AND CHIMÆRA.

DIPŒ'NUS AND SCYL'LIS (Lat., from Gk. Δίποινος, *Dipoinos*, and Σκύλλις, *Skyllis*). Early Greek statuaries, whose names are always associated. According to Pliny the Elder, they were born in Crete about B.C. 580. Pausanias in the 'Ελλάδος Περιήγησις, or *Itinerary of Greece*, states that they were pupils of Dædalus. Certainly their manner was that traditionally styled Dædalian, which prevailed to the beginning of the fifth century B.C., as the result of the marked development in sculpture toward accuracy and expressiveness. At Sicyon they executed statues of the gods, intended, apparently, for ornament in architecture rather than for devotional uses. Many works by them existed also at Ambracia, Argolis, and Cleonæ. A group of the Dioscuræ in ebony and ivory at Argolis is of particular interest as indicating Dipœnus and Scyllis as the originators of gold and ivory overlaying in statuesque art. This method reached its perfection in the chryselephantine masterpieces of Phidias. Dipœnus and Scyllis were also reputed to have been the first famous artists in marble.

DIP OF THE HORIZON. See DEPRESSION.

DIP OF THE MAGNETIC NEEDLE. The angle between a freely suspended magnetic needle and the horizontal. It is proportioned to the vertical component of the earth's magnetism, as compared with the horizontal. At the magnetic pole the needle stands vertical; at the magnetic equator it is horizontal. *Dip* has periodic variations, but of less magnitude than those of the variation. During the past three hundred years the dip at London has changed only four degrees, and the daily inequalities do not exceed four or five minutes. See MAGNETISM, TERRESTRIAL; INCLINATION; COMPASS; and DIPPING NEEDLE.

DIPO'LIA, OR DI'IPO'LIA (Lat., from Gk. τὰ Διπόλια, Διιπόλια, Διιπόλεια, from Διί, *Dii*, to Zeus + πολιεύς, *polieus*, guardian of the city, from πόλις, *polis*, city). An ancient Athenian festival celebrated annually on the fourteenth day of the month Scirophorion (June to July) to Zeus Polieus (Ζεὺς Πολιεύς), the protector of the city. It was called *Buphonia*, from the sacrifice of an ox, which was the principal feature of the celebration. Grain and sacred cakes were laid upon the altar of Zeus on the Acropolis. When the ox, brought before the altar, began to eat the grain, he was felled with an axe by the priest, who at once fled, throwing away the axe. This was then arraigned in the Prytaneum, and condemned to be thrown over the borders. Consult Mommsen, *Feste der Stadt Athen* (Leipzig, 1898).

DIPPEL, dĭp'pel, ANDREAS (1866—). A German singer, born in Cassel. He studied music in Berlin, Milan, and Vienna, and made his first appearance in 1887 in Bremen as Pilot in *The Flying Dutchman*. Afterwards he sang in opera in London, Breslau, Vienna, and Bayreuth, and in 1890-92 and 1898-1901 in the United States. In 1902-3 he made a concert tour in the United States, and in 1904-6 he again sang in opera in this country.

DIPPEL, JOHANN KONRAD (1673-1734). A German religious enthusiast and alchemist. He was born near Darmstadt, August 10, 1673, studied at Giessen, lectured on alchemy in Strassburg, but was expelled for alleged disorderly conduct, and henceforth led a wandering life. From 1719 to 1725 he was imprisoned in the Danish fortress at Bornholm for his incautious remarks upon the Danish Government; then went to Sweden, but thence he was banished through the influence of the clergy, who did not like his views. He died at Berleburg, April 25, 1734. He was the discoverer of Dippel's oil and Berlin blue. His writings are a mixture of heresy and orthodoxy, piety and rationalism. Several of them he wrote under the pseudonym Christianus Democritus. For his *Life*, consult W. Bender (Bonn, 1882).

DIPPEL'S ANIMAL OIL (first prepared by J. K. Dippel in 1711). One of the products of the destructive distillation of bones. In the crude state, it forms a thick viscid oil of a brown color, and a very disagreeable odor, but on redistillation it may be obtained limpid and colorless. When taken internally in moderate doses it acts as an anti-spasmodic, and stimulates the vascular and nervous systems. At present, however, it is no longer used in medicine.

DIP'PER. A common name for the constellation *Ursa Major* (q.v.). See CHARLES'S WAIN.

DIPPER. (1) A small, somewhat thrush-like bird of the family Cinclidæ, having an almost straight, compressed, sharp-pointed bill; compact, waterproof plumage, and extraordinary habits. Dippers frequent clear, pebbly streams and lakes, feeding chiefly on mollusks and on aquatic insects and their larvæ, which they seek even under water, diving with great facility, and moving about for a short time at the bot-

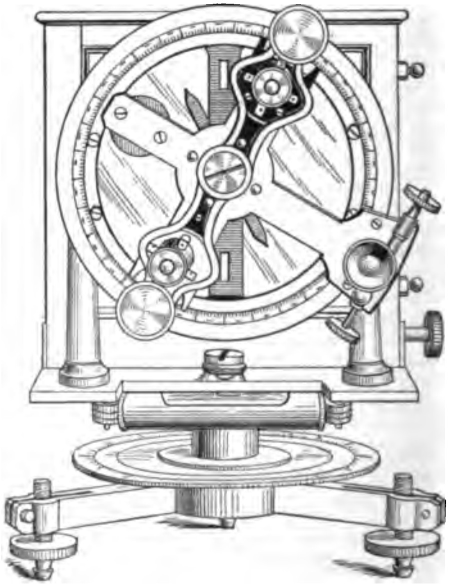
THE AMERICAN DIPPER.

tom of the water. They carry their rather short tails elevated after the manner of wrens, which they also resemble in their 'frequent becks,' or dipping of the head accompanied with an upward jerking of the tail. The common European dipper, water-ousel, or water-crow (*Cinclus aquaticus*), is a bird smaller than any of the British thrushes, of a generally dark-brown color, with throat and upper part of breast pure white. It is found chiefly in hilly or mountainous districts, and is not gregarious. The dipper never fails to attract notice, as it sits upon some stone in the midst of or beside the stream, its white breast rendering it conspicuous as it repeats the movements from which it derives its name. It builds a very curious nest of interwoven moss, domed and with the entrance in the side, usually in some mossy bank close by a stream, and often near or under a cascade. The eggs are pure white. The assertion that the dipper walks without apparent muscular effort at the bottom of the water is incorrect; its feet are not well formed for walking, and it scrambles about under water by help of its short wings. The statement, also often made, that it eats the spawn of salmon and other fishes, in the belief of which it is much persecuted in Scotland, has proved erroneous. About twelve species of dipper are known, one of which (*Cinclus Mexicanus*) is found in the mountains of western North America from Alaska to Mexico; this lacks the pure white under parts of the European species, but otherwise resembles it closely. Its habits have been eloquently described by Muir, in "The Humming-Bird of the Californian Waterfalls," an illustrated article in *Scribner's Monthly* (New York, 1878). Consult, also, Keyser, *Birds of the Rockies* (Chicago, 1902).

(2) The bufflehead, or spirit-duck. See BUFFLEHEAD.

DIPPING-NEEDLE. If a magnetic needle be supported so as to be free to move in a vertical plane, at most places on the earth's surface, it does not rest in a horizontal position, but has a certain amount of inclination. If the vertical plane in which the needle moves is the magnetic meridian of the place, the angle between the needle and the horizontal line is called the dip or inclination of the needle. The dip of the magnetic needle at any place can be ascertained with exactness by means of the dipping-needle. It consists of a graduated circle fixed vertically in a frame, which can be revolved on a horizontal graduated circle. This last is supported on a tripod furnished with leveling screws. At the centre of the vertical circle, there are two knife-edges of agate, supported by the frame, and parallel to the plane of the circle. The needle rests on these knife-edges by means of two fine polished cylinders of steel, which are placed accurately at the centre of the needle, and project at right angles from it. The needle is adjusted so as to move with little or no friction; it is so balanced, moreover, that before it is magnetized it will remain indifferently in any position; after magnetization, therefore, the dip which it shows is wholly due to the magnetic influence of the earth.

In order to understand how an observation is made with the dipping-needle, we must regard the directing force of the earth's magnetism exerted upon the poles of the needle in any vertical plane in which it may happen to be, as resolved into two forces, one acting at right angles to the plane, and the other acting in the plane. There being a corresponding but opposite force at each pole, we have thus two statical couples acting on the needle—one tending to turn it at right angles to the plane in which it moves, and the other tending to bring it round to a position in the plane such that the needle and the forces of the couple may be in a line. In the dipping-needle, the mode of support completely neutralizes the first of the couples; and the position that the needle takes in any plane is due wholly to the second. When the plane of the needle is at right angles to the magnetic meridian, the forces of this latter couple act vertically, and bring the needle to the same position. This, then, gives us the means of determining the magnetic meridian, for we have only to bring the vertical circle round till the needle stands at 90° to put it in a plane at right angles to that meridian; and then by moving the vernier on the horizontal circle over 90°, we place the upper circle and needle in the plane of the magnetic meridian. The dipping-needle thus serves the purpose of a declination needle (q.v.). In bringing the needle round from the plane at right angles to the magnetic meridian, the dip is less and less, till it becomes least in the plane of that meridian. We might thus also find the magnetic meridian, for it is that plane in which the dip of the needle is least. When the needle is in the plane of the magnetic meridian, the couple which acts in other vertical planes at right angles to them disappears, and the whole force of the terrestrial magnetism acts at each pole of the needle, forming a couple which swings the needle round till it stands in a line with itself. The degree on the circle then pointed to by the needle is the dip at the place of observation. Two readings are necessary, for the reason stated under the DECLINATION NEEDLE. One reading is taken, the needle is then reversed so as to change its supports, and then a second



DIPPING-NEEDLE—KEW PATTERN.

reading is noted, and the mean of the two gives the correct reading. The position of the needle when the dip is read off is manifestly the same that a needle suspended in air, if that were possible, and free to move in any way, would finally assume. In resolving, therefore, the total directive force of the earth as we have done above, we must keep in mind that it always acts parallel to the direction of the dipping-needle.

The direction and intensity of the earth's magnetism may be roughly represented by supposing that there is a magnet at the centre of the earth whose length is very small in comparison with the earth's diameter, and which makes an angle of about 20 degrees with the earth's axis of rotation. A line passing through the earth coinciding with the length of the magnet would mark the north and south magnetic poles on the surface of the earth. The magnetic equator would therefore be a circle around the earth perpendicular to the magnetic axis, making an angle of about 20 degrees with the geographical equator. As we proceed from the magnetic equator towards the magnetic poles, the amount of dip increases from zero to 90 degrees, and there is also a considerable change of dip from time to time at any one place. The dip in Paris was 75° when it was first observed in 1671, and from this it had fallen to 65° 18′ in 1885, and at the present time is about 65°. See MAGNETISM, TERRESTRIAL; INCLINATION.

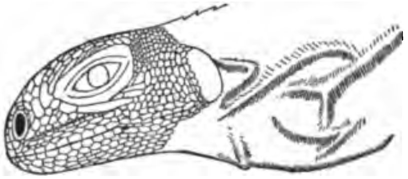
DIPRO′TODON (Neo-Lat., from Gk. *δι-*, *di-*, double + *πρῶτος* *prōtos*, first + *ὀδῶν*, Ionic for *ὀδούς*, *odous*, tooth). An extinct herbivorous marsupial, of the size of a rhinoceros, related to the kangaroos and phalangers, and found fossil in the Pleistocene deposits of Australia. The skull is heavy, about three feet in length, and has a peculiar dentition. There are no canine teeth; the inner pair of upper incisors are enlarged, elongated, and chisel-shaped, like those of rodents. The lower incisors, two in number, are likewise elongated to meet those of the upper jaw, and, like these, they grew from persistent pulps; i. e., they continued to grow from their roots as they were worn away at their crowns, after the fashion of the incisors of rodents. Another related but somewhat smaller genus, Nototherium, the remains of which are found with those of Diprotodon, has a very similar dentition. These two fossil genera are the giants among the marsupials. See MARSUPIALIA.

DIP′SACUS. See TEASEL.

DIP′SAS (Gk. *διψάς*, venomous snake, whose bite caused intense thirst, from *δίψα*, *dipsa*, thirst). A genus, or family, of tropical serpents —the nocturnal tree-snakes. See TREE-SNAKE.

DIPSOMANIA (Neo-Lat., from Gk. *δίψα*, *dipsa*, thirst + *μανία*, *mania*, madness). A variety of periodic insanity. The patient manifests, during certain periods, an uncontrollable desire for alcoholic liquors, and drinks to great excess, while during the intervals he abstains entirely from the use of liquor and seems mentally sound. The dipsomaniac is not a drunkard, nor a 'moderate drinker.' He often experiences a positive aversion for the smell and taste of liquors, but when the imperative appetite seizes him, after a period of abstinence and of orderly, refined, and irreproachable conduct, he abandons himself to unrestrained indulgence. Dipsomania is a degenerative insanity; that is, an insanity dependent upon an hereditary or acquired constitutional condition. The outlook for recovery is bad.

DIP′SOSAU′RUS (Neo-Lat., from Gk. *δίψα*, *dipsa*, thirst + *σαῦρος*, *sauros*, lizard). A small, remarkable iguanid lizard (*Dipsosaurus dorsalis*) of the Colorado and Mohave deserts and Lower California. It has a very small head, a conspicuous ridge of keeled scales along the back, and a long, compressed tail. It is sand-colored, with obscure blotches on the sides, and the sides and legs streaked with brownish red. It is a strict vegetarian, feeding wholly on buds and flowers. Its nearest ally is the collared lizard (q.v.).



HEAD OF DIPSOSAURUS DORSALIS.

DIP′TERA (Neo-Lat. nom pl., from Gk. *δίπτερος* *dipteros*, two-winged, from *δι-*, *di-*, double + *πτερόν* *pteron*, wing). An order of insects, the flies, characterized prominently by the development of only two wings, which are the front pair and membranous, while the posterior pair is represented by two club-shaped organs known as halteres or "poisers"; and by having mouth-parts fitted only for sucking and piercing, but not for gnawing. Their metamorphosis is complete. See FLY.

DIP′TERUS (Neo-Lat., from Gk. *δίπτερος*, *dipteros*, two-winged). A genus of fossil dipnoan fishes of the family Ctenodontidæ, found in the Old Red Sandstone of the Scottish Devonian. The body is small, rather slender, tapering gradually toward the heterocercal tail, and is covered by circular enameled scales. The head is low and blunt anteriorly, and the skull-bones are small and numerous. There are a pair of pectoral fins and two dorsal fins, situated posteriorly, opposite the pelvic and anal fins, and all of these have their bases covered for a considerable distance with the enameled scales of the body. See LUNG-FISH.

DIPTYCH, dĭp′tĭk (Lat. *diptycha*, nom. pl. from Gk. *δίπτυχος*, *diptychos*, folded double, from *δι-*, *di-*, double + *πτυχή*, *ptychē*, fold, from *πτύσσειν*, *ptyssein*, to fold). A double writing-tablet, or two writing-tablets which could be folded together. Herodotus speaks of such a tablet, made of wood and covered with wax. It was in the later Roman time, however, that they were most used, and those which have been preserved belong chiefly to the period when classical was merging into mediæval life. The beautiful carving with which they are often covered on the outside, consequently, represents not unfrequently a combination of classical and of Christian subjects. Ivory and metal were sometimes employed in place of wood; but the construction was always the same, the wax with the writing being in the inside. Under the emperors, diptychs were distinguished into consular and ecclesiastical. The former, which were presented by the consuls and other magistrates to their friends, and those officially connected with them, on their entrance into office, were inscribed with their names and bore their portraits. The ecclesiastical diptychs, on the other hand, are decorated with scenes from sacred history, and were preserved in the churches as part of the sacred ornaments. Those that exist are of various sizes, rarely exceeding eight inches by four. See TRIPTYCH.

DIP′YLON GATE (Gk. δίπυλον, from δι-, *di-*, double + πύλη, *pylē*, gate), THE. The most important gate in ancient Athens, between the inner and the outer Ceramicus. It consisted of two sets of double gates, separated by a court. From it the Sacred Way led to Eleusis. The dead were buried near the gate, and in the vicinity a number of beautiful ancient tombs are in part preserved. Portions of its foundations and remains of the walls of Themistocles still exist.

DIRCE, dẽr′sē (Lat., from Gk. Δίρκη, *Dirkē*). In Greek legend, the personification of a fountain and stream at Thebes. Besides the fountain, there was the grave of Dirce, at which sacrifices for the dead and other rites were performed. According to the story, Dirce, the wife of Lycus, King of Thebes, had sorely persecuted Antiope, who at last escaped to Mount Cithæron, where her twin sons, Amphion and Zethus, had been brought up by a herdsman in ignorance of their parentage. Here Dirce, while celebrating the rites of Dionysus, found her, and ordered Amphion and Zethus to bind her to the horns of a wild bull, that she might be dragged to death. They were about to execute the command, when by the aid of the herdsman they learned their relationship to Antiope, and thereupon inflicted upon Dirce the punishment she had designed for their mother.

DIRCKS, HENRY (1806-73). An English civil engineer and author, born in Liverpool. He began to lecture on chemistry and electricity in 1827. Afterwards he became distinguished as a railway and mining engineer, in which capacity he made several inventions. The unique mechanical device known as 'Pepper's Ghost' was invented by him, and described in the work entitled *The Ghost, as Produced in the Spectre-Drama, Popularly Illustrating the Marvellous Optical Illusions Obtained by the Apparatus Called the Dircksian Phantasmagoria* (1863). Another interesting work by him is the *History of the Search for Self-Motive Power* (1861).

DIRECT (Lat. *directus*, straight, from *dirigere*, to direct, from *di-*, apart + *regere*, to guide), and **RET′ROGRADE** (OF. *retrograde*, Fr. *rétrograde*, Lat. *retrogradus*, moving backward, from *retro*, backward + *gradi*, to go). In astronomy, the motion of a planet is said to be direct when the planet goes forward by its proper motion in the zodiac according to the succession or order of the signs (i.e. from west to east), or when it appears to do so to an observer. On the other hand, it is said to be retrograde when it appears to go the contrary way.

DIRECTOR. One of the persons chosen to act as a board of managers to control the affairs of a business corporation or joint-stock company. Officers acting in a similar capacity for eleemosynary corporations are usually, though not necessarily, known as trustees. The director is usually a stockholder of the corporation and elected to his position by vote of the stockholders, the length of time for which he may hold his office and the manner of his election being determined by the by-laws of the corporation.

The director is in a certain sense the agent for the corporation. He represents the corporation and not its stockholders, and, while not strictly a trustee, he acts in a fiduciary capacity, and his responsibility is not unlike that of a trustee. At common law the director is under no personal liability for the debts or obligations of the corporation. He is liable to the stockholders in an action of tort for gross negligence or misfeasance in office resulting in loss to them. He is prohibited from using his position of trust for personal profit, and his contracts made with the corporation for that purpose may be set aside on application of a stockholder to the courts.

Generally speaking, the directors, acting as a board or through properly appointed agents, have authority to do any act in the line of the legitimate business of the corporation which the company may itself do under its charter; but they may not totally change that business nor dispose of what is essential to it without the consent of the stockholders. Yet in some jurisdictions they may by their act bind the corporation to do acts which are strictly *ultra vires.* See CORPORATION.

In practice, much of the business of the board of directors is transacted by a committee of its members, usually termed an executive committee, whose powers are defined by the by-laws of the corporation or by vote of the board of directors. In boards of bank directors in England a distinction is made between ordinary and extraordinary directors, the former conducting the business in its details, the latter having little to do with the actual business, and in reality being honorary officers who allow their names to be used to benefit the undertaking by the distinction attached to them from their personal or financial position. This practice is not common in the United States, though not unknown. The disposition of the profits of the corporation is, under most charters, left largely to the directors. Thus they may, if they choose, apply profits to the extension of facilities or purchase of new plant, or other improvements, rather than to dividends, in their discretion and without a vote of the stockholders.

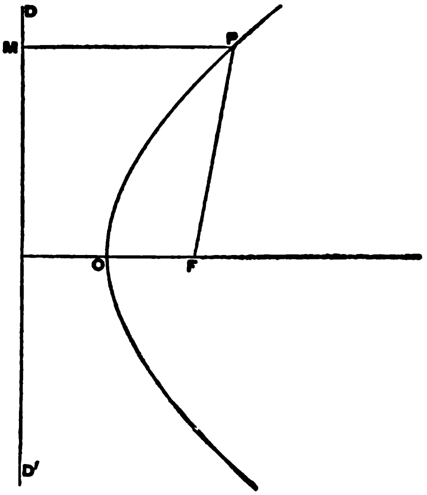
Modern statutes have increased the liability of directors of corporations to an extent varying considerably in the different States of the United States. A provision sometimes made is one making directors personally liable for the debts of the corporation if they do not file annually with the Secretary of State a report upon the affairs and business of the corporation. Under the special English statutes known as the Joint Stock Companies Acts, the duties and responsibilities of directors are very clearly defined. It is provided that if the directors of a company declare a dividend when the company is known to them to be insolvent, or declare a dividend to pay which would to their knowledge make it insolvent, they shall be personally liable for the debts of the company to an amount equal to the dividend declared under such circumstances; in the United States the common law on this point generally prevails.

It is customary to pay directors a slight fee for their services, but this is usually insignificant in comparison with the interests involved; usually the motive of the director in taking the office is the prosperity of the concern as benefiting him in the position of a stockholder. See CORPORATION; and consult the authorities there referred to.

DIRECTORY (Fr. *directoire*, from Lat. *directorius*, serving to direct, from Lat. *dirigere*, to direct). The name given to the executive Government in France from October 28, 1795, to November 9, 1799. After the overthrow of the ultra-Jacobins, the moderate Republicans promulgated a new constitution, that of the year III., which provided for a legislative body of two councils. The Council of Five Hundred was to propose the laws, the Council of Ancients was to pass on them. As executive head, five members, chosen from both bodies, were to act. The first five Directors chosen were Barras, Carnot, Rewbell, Laréveillère-Lépaux, and Letourneur. Each was to preside for three months at a time, and one had to retire every year. Though the foreign policy of the Directory was successful at first, its management of home affairs was corrupt and incompetent in the extreme. The members formed factions, and Barras, with his associates Laréveillère and Rewbell, succeeded in ousting the other two Directors, Carnot and Barthélemy, who had succeeded Letourneur, by the coup d'état of 18th Fructidor (September 4, 1797). At the end of that year the Directory consisted of Barras, Ducos, Gohier, Moulins, and the Abbé Sieyès; but the last of these had begun to plot against the Constitution, and the military disasters of 1799 furnished a pretext for its overthrow by the coup d'état of the 18th Brumaire (November 9, 1799), which resulted in the establishment of the Consulate (q.v.), with Napoleon as First Consul. Consult: Granier de Cassagnac, *Histoire du Directoire* (3 vols., Paris, 1863); Barante, *Histoire du Directoire* (3 vols., Paris, 1855); Pierre, *La Terreur sous le Directoire* (Paris, 1887). See FRANCE.

DIRECTORY FOR THE PUBLIC WORSHIP OF GOD. A code of regulations which governs public worship in the Church of Scotland and supplies the place of the Anglican Book of Common Prayer. It was compiled by the Westminster Assembly in 1644, by order of both Houses of the English Parliament, and was adopted by the Church and the Parliament of Scotland in 1645. Many of its regulations are still adhered to by the Scottish Presbyterian Church. Consult Neale, *History of the Puritans*, vol. v. (London, 1822).

DIRECTRIX OF A CONIC. A straight line perpendicular to the axis, by reference to which the nature of the conic may be defined. Assume an indefinite straight line as the directrix, and a point without the directrix as the focus; then if a line be revolved about the focus any point moving in the line will generate a curve, which will be a conic section (q.v.), provided there is a constant ratio between the distance from the moving point to the focus and the perpendicular distance from the point to the directrix. The curve is an ellipse, a parabola, or an hyperbola, according as the distance from any point of the curve to the focus is less than, equal to, or greater than the perpendicular distance from the point to the directrix. The constant ratio mentioned is often called the determining ratio of the conic. In the figure, DD′ represents the directrix of a parabola, F the focus, O the vertex, and P any point on the curve. According to the determining ratio, PM = PF. The focus is the pole of the directrix and the directrix is the polar of the focus. Quadric surfaces also have directrices. See POLE AND POLAR; CYLINDER.



DIRICHLET, dē'rēsh'lā', PETER GUSTAV LEJEUNE (1805-59). A German mathematician. He was born at Düren, and was successively professor of mathematics at Breslau, Berlin, and Göttingen, where he succeeded Gauss in 1855. His memoirs on the theory of numbers are important, the most original being that on the determination of means with application to the distribution of prime numbers. He has also permanently influenced the theory of mechanics by his work on potentials. His papers on the theory of numbers were edited by R. Dedekind (Brunswick, 1879-81). His work on the theory of potentials was edited by F. Grube (Leipzig, 1887).

DIRK. See DAGGER.

DIRKSEN, dērk'sen, HEINRICH EDUARD (1790-1868). A German jurist. He was born at Königsberg, and studied at Heidelberg and Berlin. In 1817 he was appointed professor of Roman law at the University of Königsberg, where he remained until 1829, when he received a call to Berlin. He was one of the greatest authorities of his time on the history and sources of Roman law, to which subject he contributed the following valuable works: *Manuale Latinitatis Fontium Juris Civilis Romanorum* (1837-39); and *Beiträge zur Kunde des Römischen Rechts* (1825).

DIRSCHAU, dēr'shou. A town of Prussia, in the Province of West Prussia, on the Vistula, about 19 miles southeast of Danzig (Map: Prussia, H 1). The river is here crossed by two fine bridges. The chief article of manufacture is sugar. There are also large machine and car works. Population, in 1890, 11,897; in 1900, 12,800; in 1905, 14,190. Dirschau received municipal rights in 1260, and in 1308 it came into the possession of the Knights of the Teutonic Order. By the Peace of Thorn in 1466 it was given to Poland, but it became Prussian on the first partition of Poland in 1772.

DIS, or **DIS PATER.** The Roman name for the god whom the Greeks call Pluto (q.v.).

DISABILITY. As a legal term, the want of power to do a particular act or class of acts. It may result from bodily or mental incapacity, or from a rule of law. Of the first sort is the disability referred to in accident insurance policies, which provide for payments to persons who, by reason of physical injuries, are unable to work; also in statutes which make provision for the support of poor persons who are physically or mentally incapable of procuring a livelihood. Other examples of this class are afforded by lunatics and infants of tender years. Disabilities, originating in a rule of law, are those attaching to aliens, to infants who have reached the age of discretion, to married women under the common law, and to other special classes of persons. The reasons for imposing these legal disabilities upon persons who possess natural capacity for action are set forth in the articles treating of such persons, to which the reader is referred. Perhaps he should be reminded in this connection, however, that some disabilities are intended as a protection or benefit to their subject, while others are imposed either by way of penalty or for the protection of individuals or of society at large. An example of the first class is the legal incapacity of the minor who has not reached years of discretion. For his protection the law denies him the power of binding himself by contract. Yet the law does not sever him from responsibility for his torts or crimes. His disability is allowed to operate as a shield, but not as a sword. To the second class belong the disabilities imposed upon criminals or upon aliens or upon those who are denied the exercise of the elective franchise or are disqualified for holding public office. For a more detailed account of the legal consequences of legal disabilities, consult Adverse Possession; Alien; Attainder; Contract; Deed; Duress; Limitation of Actions; and Negligence.

DISAPPOINTMENT, Cape. See Cape Disappointment.

DISBARMENT. The act of depriving an attorney, counselor at law, solicitor, or barrister of his rights and privileges as such. The power to do this rests with the courts, and they may take this action, upon sufficient cause, on complaint of any one, or of their own motion, where the cause comes to their knowledge directly. It may be exercised when an attorney has been guilty of gross contempt of court, dishonesty, extortion, or professional misconduct of a serious nature, and in some jurisdictions where he becomes a person of general bad character, so that he cannot be considered a fit person to be intrusted with the legal business of others. He must be given an opportunity to be heard in his own behalf, usually in open court, and may cross-examine any witness who may testify against him, and produce witnesses in his own favor, much as if he were under indictment for a crime. It is considered a severe penalty, as it deprives the person from earning a livelihood by his profession, and is only imposed in grave cases and after a thorough investigation and consideration. Where the conduct has been culpable, but there is reason to believe that it will not be repeated, the court will sometimes suspend the attorney from practice for a definite period, on the expiration of which he resumes his former rights and privileges. The court may restore one who has been disbarred to practice, in its discretion, where proof is presented that he will probably conduct himself properly in the future. See Attorney, and consult the authorities there referred to; see also Barrister; Counselor; Solicitor; Court.

DISCHARGE (OF. *descharge*, from *descharger*, Fr. *décharger*, It. *discaricare*, *scaricare*, from ML. *discargare*, *discarricare*, to unload, from *dis-*, away + *carricare*, to load, from Lat. *carrus*, car, from Gall. *carros*, Ir., Welsh, OBret. *carr*, car), Military. At military law an enlisted man is, in general, entitled to his discharge from the service in writing when he has completed his term of enlistment. He cannot be discharged before the expiration of his term except (1) by order of the President; (2) by sentence of a general court-martial; (3) on a certificate of disability; (4) on a writ of habeas corpus. A discharge is either honorable, dishonorable, or without honor, depending upon the character of the service rendered and the circumstances under which it is given. The President may, in his discretion, permit a soldier to purchase his discharge. An officer failing on a reëxamination is honorably discharged with one year's pay from the army. Consult *United States Army Regulations* (Washington, 1901).

DISCHARGE OF ELECTRICITY THROUGH GASES. See Electricity.

DISCIPLES OF CHRIST, or Christians. This religious body, sometimes called, without its consent, 'Campbellites,' represents a movement in the Church in the interest of union by a return in faith and life to the Christianity of the New Testament. They are distinctly American in their origin. Simultaneously in different sections of the country arose teachers among the religious denominations who pleaded for the Bible alone without addition in the form of creeds or formulas of faith, and for the union of Christians of every name upon the basis of the Apostles' teaching. This movement assumed most notable proportions in western Virginia and Pennsylvania, and in Kentucky. Thomas Campbell and his son Alexander (q.v.), of Bethany, Va., renounced the Presbyterian system and were immersed in 1812, and with the congregations they had formed united with the Redstone Baptist Association, and, ten years later, with the Mahoning Association. In 1823 Alexander Campbell began to set forth with great vigor and learning in a periodical entitled *The Christian Baptist* a plea for the simple gospel order of things, as under the Apostles. It was not a reformation he urged, but 'a restoration'; not the organization of a new sect, or the reformation of an old one, but a return to Jerusalem, the renewal of the ancient landmarks of the Christian religion, the restoration of Apostolic Christianity, its doctrines, ordinances, and fruits. His protest against human creeds as bonds of union, and plea for the all-sufficiency of the sacred Scriptures, aroused opposition, and the views he advocated were in many quarters denounced as heterodox. Great numbers, however, accepted them, and under the preaching of Campbell and Walter Scott, an evangelist of the Mahoning Association, many new churches were formed, until the Baptists began to declare non-fellowship with these brethren, and they were forced to form themselves into distinct communities.

Barton W. Stone, a Presbyterian minister in Kentucky, began a similar movement to that of the Campbells in 1804. A Church was organized at Cane Ridge, Bourbon County, accepting the Bible alone as possessing authority in the religious life, and the name 'Christian' as a sufficient designation of all who believe on Christ. Correspondence between Stone and Campbell led finally to the union of the two movements in 1831.

In January, 1830, Mr. Campbell began the publication of the *Millenial Harbinger,* which he edited until his death in 1866. In his periodicals, by his preaching, and debates, his views were widely circulated. Since his death the Disciples of Christ have made great advance in numbers and along all lines of religious activity, until their statistics for 1905 show 11,110 churches with 1,238,515 communicants. They report also 8761 Bible-schools with an enrollment of 850,000 children. They raised during the year $874,517 for missions, home and foreign, and $486,023 for education and benevolence. Among the 24 schools and colleges controlled by the church is Drake University at Des Moines, Iowa. Their strength lies chiefly in the north central States.

In agreement with what are termed Evangelical Christians, the Disciples accept the divine inspiration of the Holy Scriptures; the revelation of God in the tri-personality of Father, Son, and Holy Spirit; the all-sufficiency and alone-sufficiency of the Bible as a revelation of God's will, and a rule of faith and practice to His creatures; the divine excellency of Jesus Christ as the Son of God, His incarnation, doctrine, miracles, death as a sin offering, resurrection, ascension, and investment with supreme authority; the personal mission of the Holy Spirit to convince the world of sin, righteousness, and judgment, and to comfort and sanctify Christians; the alienation of man from God and his dependence upon the divine mercy in Christ; the necessity of faith and repentance to salvation; the importance of baptism and the Lord's Supper as divine ordinances; the duty of observing the Lord's Day in memory of the resurrection of Jesus Christ; the necessity of righteousness, holiness, and benevolence in Christians; the divine appointment of the Church of Christ, composed of all who by faith and obedience confess His name, with its ministries and services for the edification of Christians and conversion of the world; the fullness of the Gospel to all who will accept it on the New Testament conditions; the final judgment with the reward of the righteous and punishment of the wicked.

In disagreement with other Christians, the Disciples hold: That while both Old and New Testaments are equally inspired, both are not equally binding upon Christians; the Old was God's will with reference to the Jews, the New is His will with reference to us (Heb. i. 1). Accepting fully the Scripture statements concerning the Godhead, they repudiate the philosophical speculations both of Trinitarians and Unitarians and do not use the theological terms common to the schools, but insist upon 'the form of sound words' given in Scripture concerning Father, Son, and Holy Spirit. Accepting the Bible as an all-sufficient revelation of the divine will, they repudiate all authoritative creeds and human grounds of fellowship. Receiving Jesus in all His divinity and Christhood, they accept the truth that Jesus is the Christ, the son of the living God, as the one article of faith, as the creed of the Church, the fundamental fact of Christianity, and belief with all the heart in Jesus as the Christ is all the confession of faith they ask preparatory to baptism and Church membership. Recognizing the agency of the Holy Spirit in conversion, they repudiate all theories of special spiritual operations outside of the Word, demanding of the sinner that he shall hear, believe, repent, and obey the Gospel in order to secure the remission of his sins. Admitting the necessity of faith and repentance, they submit no other tests, no human formula of belief, but on a confession of Christ and heartfelt desire to give up sin and work righteousness men are baptized and received into the Church. Accepting baptism as a divine ordinance, they insist that "He that believeth and is baptized shall be saved"; they command men: "Repent and be baptized every one of you in the name of Jesus Christ for the remission of sins"; and claim that evidence of pardon and of the gift of the Holy Spirit is not in dreams and visions, but in the sinner's knowledge of his Scriptural faith, repentance, and obedience to the Gospel. Claiming the Lord's Supper to be a divine ordinance, they consider it not as a sacrament, but a memorial feast, and keep it on every first day of the week, meeting as the Lord's people and recognizing neither open nor close communion, since neither of these is known in the Scriptures of divine truth. Regarding the Lord's Day, they hold it not as the Sabbath, but as a New Testament appointment in memory of the resurrection, to be observed as a day of rest and worship for the assembly and communion of saints, preaching of the Gospel, administration of the ordinances, and training of families in the nurture and admonition of the Lord. Cherishing the Church of Christ, they regard it not as a sect, but a divine institution. They submit that sects are not branches of the Church of Christ, but are unscriptural. The body of Christ is one, of which Christ alone is the head.

The Disciples in regard to the action of baptism are in accord with the Baptists. Immersion is with them the only baptism that is scriptural and that could be universally accepted. As to the subjects of baptism, they baptize only believers in Christ. With respect to the design of baptism, they accord more with Pedobaptists. They baptize for 'the remission of sins'; and claim that the sinner in obeying this ordinance appropriates God's promise of pardon, relying on the divine testimony (Mark xvi. 16; Acts ii. 38). They date the beginning of the Christian institution on Pentecost, and the New Testament with them contains the history, constitution, and laws of the Church of Christ. In Church government they are Congregational, and have no distinction of clergy and laity and recognize the local church with its elders and deacons as the highest ecclesiastical authority. They are organized, however, with district, State, and national organizations for missionary and benevolent work.

BIBLIOGRAPHY. *Doctrinal.* — A. Campbell, *Christian System* (Cincinnati, 1853); I. Errett, *Our Position* (Cincinnati, 1885); J. H. Edwards, *Orthodoxy in the Civil Courts* (ib., 1887); J. S. Lamar, *First Principles and Perfection* (New York, 1895); B. B. Tyler, *Peculiarities of*

Disciples (Cincinnati, 1897); J. H. Garrison, *Old Faith Restated* (Saint Louis, 1890); F. D. Power, *Bible Doctrine for Young People* (ib., 1899). *Historical.*—Richardson, *Life of Alexander Campbell* (Philadelphia, 1868); Williams, *Life of Elder J. Smith* (Cincinnati, 1870); Baxter, *Life of Elder W. Scott* (Cincinnati, 1874); B. B. Tyler, *History of Disciples* (New York, (1894); Power, *Sketches of Our Pioneers* (Cleveland, 1898); J. H. Garrison, *The Reformation of the Nineteenth Century* (Saint Louis, 1901); Gates, *Disciples of Christ* (New York, 1905).

DIS'CIPLI'NA ARCA'NI (Lat., discipline of the secret). A seventeenth-century term, applied to a system of the early Church which treated certain rites as mysteries and withheld them from the knowledge of the uninitiated. There is no trace of this secret discipline before the end of the second century. It emerges into view during the third, and is well established in the fourth and fifth centuries, which constitute its most flourishing period. The writers who set forth the mystery idea are Origen, Athanasius, Basil, Epiphanius, Chrysostom, Cyril of Jerusalem, Cyril of Alexandria, Theodoret, Ambrose, Augustine, and Pseudo-Dionysius Areopagita. It appears also in the Apostolic Constitutions. From the sixth century onward, when Christianity had won the victory over paganism, we hear less and less of the secret discipline, yet its influence is clearly traceable in Eastern and Western Catholicism, even down to modern times (cf. e.g. the *Russian Catechism* of 1839).

Baptism and the eucharist were the two rites of the Church to which especially the mystery idea became attached. To call baptism a 'seal,' or 'illumination'; to speak of 'the initiated' and 'the uninitiated'; to use the term 'mystery' for the holy communion, or for the creed, or for the Lord's Prayer—all this denotes assimilation of heathen modes of expression and of thought. The process went on during the period when the Church was receiving her largest accessions from the decadent Græco-Roman and Oriental religions. And it could hardly be expected that an institution with solemn rites and formulas of its own, which thus drew constituents from other religions, should remain wholly free from their influence, or escape the unconscious appropriation of some of their ideas. Hence resulted significant changes in the Christian sacraments, and mystagogy took the place of pedagogy in Christian nurture. The creed came to be regarded as a mystery because it was formally delivered to the catechumen at his baptism; the Lord's Prayer, because of its prominence in the communion office. These things were often withdrawn from public mention, or referred to only remotely, with such words as "the initiated know what I mean," etc. Sozomen will not include the Nicene Creed in his *History*, for fear some of the profane may read the book. Ambrose warns the Church to "guard against incautiously divulging the mystery of the creed or of the Lord's Prayer." Chrysostom explains reticence with regard to the latter by asserting that "no unbaptized person can call God his Father." Athanasius rebukes those who are "not ashamed to parade the sacred mysteries before catechumens, or, worst of all, even before heathen." It was the general opinion that familiarity with such sacred things must be discouraged. Basil observes that "the veneration of the mysteries is preserved by silence." And Augustine goes so far as to assert that concealment, by provoking curiosity, helps along the extension of Christianity; for the uninitiated are eager to learn the secrets which the Church so carefully guards!

The views given in the preceding paragraph are those of a modern critical school, and are denied generally by those who hold the traditional theory of the history of Christianity. According to the latter, the early Christians, surrounded by pagan populations who were only too prone to misinterpret their teachings, and severely persecuted by the government, naturally sought concealment and practiced a prudent reticence. Regarding their doctrines as a sacred deposit, they shrank from recklessly communicating them to the profane who might distort them. Experience had taught them, moreover, that all neophytes were not sincere, and the danger of betrayal by informers who pretended conversion led them to guard the more intimate doctrines and practices from catechumens until after a long probation. Further, it was not deemed wise to communicate the fullness of truth to the unprepared mind, and for this reason also the neophyte was only gradually inducted into the mysteries of the faith. Consequently there arose among the early Christians a symbolic mode of expression by which they might communicate in public with their brethren without betraying themselves. The famous inscription discovered at Arles in 1839 furnishes an excellent example of their symbolic language: "Take the food, sweet as honey, of the saviour of the holy ones, and drink, holding the fish in thy hands"—words utterly unintelligible to the profane, but perfectly clear to the Christian, for whom the fish was the symbol of Christ, the initial letters of the Greek words for "Jesus Christ, Son of God, Saviour," forming the word *ἰχθυς*, fish. Roman Catholics hold that the discipline of the secret originated in apostolic times, and urge that the words of Tertullian (*Præscript.* 41) indicate that it was already a well-established tradition in his day (150-230). As regards its subject-matter, Protestant writers generally contend that it embraced merely certain rites of worship, and that the silence of early Christian writers on certain doctrines is evidence that they were not held by the primitive church. Roman Catholics hold that the system included doctrines as well as rites, and that it explains the silence of certain writers on points afterwards held to have been handed down by continuous tradition. For the division of the eucharistic service into two parts, from the more sacred of which the unbaptized were excluded, see LITURGY.

For the Roman Catholic view, consult: Schelstrate, *De Disciplina Arcani* (Rome, 1685); for the Protestant view, Tentzel, *Dissertatio de Disciplina Arcani* (Leipzig, 1692); also in general, Bingham, *Antiquities of the Christian Church*, bk. ix. (London, 1855); Hatch, *The Influence of Greek Ideas and Usages upon the Christian Church* (London, 1883); Anrich, *Das antike Mysterienwesen in seinem Einfluss auf das Christentum* (Göttingen, 1894); A. Weiss, *Die altkirchliche Pädagogik* (Freiburg, 1869); Wobbermin, *Religionsgeschichtliche Studien* (Berlin, 1896).

DISCIPLINE (Lat. *disciplina*, from *discipulus*, disciple, from *discere*, to learn). The method or code by which practices, rules, regulations, etc., are enforced. Applied to the individual it implies a system of mental and moral training. In its military aspect it is the means by which the army in whole or in part is enabled to respond promptly and efficiently in answer to an order. It is the key-note of military efficiency and *morale*, in that without it, uniformity, organized effort, and the effective working of the complex machinery of a successful military organization are impossible. See TACTICS, MILITARY.

DISCIPLINE, ECCLESIASTICAL. The corrective and preservative function by which organizations for the purposes of religion seek to maintain their standards of order and conduct among their members. It is a function common to all religious bodies, though it varies greatly in the objects to be attained and the means used. While the standards to be maintained have continued substantially the same, the procedure and the punitive facilities at the command of the churches have undergone radical alteration. The changes have been due in large measure to the changed relations which the churches bear to the political organization of society; that is, the State. At the beginning of its history, the Christian Church modeled its disciplinary procedure upon that in vogue in the Hebrew synagogues, where there were three degrees of punishment, all of which were species of excommunication. In the ancient Hebrew State the religious organization of society had the active coöperation of the political power in the enforcement of its discipline, which coöperation, however, was lost with the loss of political independence. The Christian Church in the apostolic and sub-apostolic ages was in a similar position and lacked the aid of the civil power in the enforcement of its discipline. In the early ages of the Church certain crimes were subject to the discipline of public penance. We learn from Tertullian on *Purity* (c. 14; and 12), and from Pacianus that they can be reduced to the heads of infidelity, luxury, and homicide. Saint Gregory of Neo-Cæsarea mentions the four classes into which the public penitents were divided. They were the weepers, the hearers, the prostrate, and those who remained (consistentes). The weepers were kept entirely outside the church door; the hearers were admitted just within the door; the prostrate, under the same rule as the hearers, were excluded from the most sacred portions of the service; the remaining penitents (consistentes) were allowed to hear the whole service, but could not receive the eucharist. (See ABSOLUTION; LAPSED.) When the Church came to be recognized by the State as the normal organization of society for the purposes of religion, her disciplinary facilities were enormously increased because of the aid received from the civil power. What had before been considered merely conduct unbecoming a baptized Christian came in many cases to be a breach of the civil law, of which the civil authorities would take cognizance. This relation of States to the churches has continued in varying degrees in the different countries of Christendom. The ancient order has been most fully preserved, perhaps, in the Empire of the Russias, where the Church is recognized by the State as the normal organization of society for the purposes of religion and where the police power of the State is in many cases at the disposal of the ecclesiastical authorities. In Western Christendom, however, the reduction in the punitive facilities of the churches has come about by the development of the sphere of individual liberty so as to include liberty of speech and action for the purposes of religion. Such a development has caused individual ecclesiastical relations to be largely voluntary, and has reduced the punitive facilities of religious organizations to a minimum, never exceeding expulsion from the communion and Church fellowship. The Church of Rome has, of all the churches, retained the most elaborate system of discipline, by the side of which has also been maintained a system of dispensations (q.v.), yet the penalties are merely ecclesiastical and not civil. In the Protestant churches, discipline consists in the infliction of three penalties: (1) Public censure, which is, as a rule, resorted to only after private admonition has been given; (2) suspension; and (3) excommunication. In Congregational churches, discipline is administered by the church body. In the Presbyterian churches these powers are exercised by the Session, an appeal lying to the Presbytery, thence to the Synod and General Assembly. In the Methodist Episcopal Church an accused member is brought to trial before a committee of not less than five members, who shall not belong to the quarterly Conference; if a majority find him guilty, the pastor executes the sentence, appeals being allowed to the quarterly and annual Conferences. Unlike the voluntary bodies, the established churches, such as the Church of England, and the Protestant establishments on the Continent of Europe, have lost nearly all disciplinary powers over the laity, who have practically by virtue of citizenship the privileges of Church membership.

In the United States, Church discipline is administered exclusively by Church officials and judicatories. The complete separation of Church and State deprives the civil tribunals of all power to revise or question ordinary acts of Church discipline, or of exclusion from Church membership. Secular tribunals have to do only with the rights of property and of personal liberty. If these are illegally invaded, under pretext of administering Church discipline, the civil courts have authority to afford redress.

Whether a Church member is amenable to ecclesiastical punishment is to be determined by the proper officers or judicatories of the particular Church, in accordance with its rules of government and discipline. From their final decision no appeal lies to a civil court. In the language of the United States Supreme Court: "The law knows no heresy, and is committed to the support of no dogma, the establishment of no sect. The right to organize voluntary religious associations to assist in the expression and dissemination of any religious doctrine, and to create tribunals for the decision of controverted questions of faith within the association, and for the ecclesiastical government of individuals, congregations, and officers within the general association is unquestioned. All who unite themselves to such a body do so with an implied consent to this government, and are bound to submit to it." The disciplinary authority of such bodies, and the rights and duties of their members, are governed by the same general rules of law that control in case of social or political clubs or other private organizations. See CANON LAW.

DISCLAIMER (from *disclaim*, OF. *disclamer*, *desclamer*, from ML. *disclamare*, to renounce, from Lat. *dis-*, apart + *clamare*, to claim; connected with Lat. *calare*, Gk. *καλεῖν*, *kalein*, to cry aloud). In law, a renunciation, repudiation, or disavowal of rights, duties, or liabilities by words or conduct. Specifically:

(1) In actions involving real estate, a renunciation by a party of his character as tenant of one of the other parties to the action. Where a tenant sets up a claim of title in himself, superior to that of his landlord, or alleges that the one of whom he nominally holds possession is not the owner, or has not sufficient interest in the property to execute a valid lease, and refuses to recognize him as his landlord, it is said to be a disclaimer, and, even if not sustained by the proof, works a forfeiture of the lease. A mere verbal refusal to recognize the lessor as landlord is not considered sufficient; it must be made where it will become a matter of record, as in a proceeding involving the rights of the landlord in the property. See EJECTMENT; LANDLORD AND TENANT.

(2) The act by which a person refuses to accept an estate which is devised or conveyed to him. This is usually accomplished by a deed, or other writing, and in order to be recognized without making application to the court, should be made before the devisee or grantee has in any way, by words or acts, shown assent to the devise or conveyance. It most frequently occurs where property is conveyed to one as trustee for another, and he does not care to assume the duties and responsibilities of the trust. See EQUITY; TRUST.

(3) In equity pleading, a written statement by the defendant, disavowing or renouncing any interest in, or claim to, the matters set forth in the complainant's bill. It is a formal mode of defense, and entitles the defendant to a hearing on the question as to whether he has any interest or connection with the matters in controversy, and if he succeeds in establishing that he has not, he is entitled to an order striking out his name as party defendant. It does not deny any of the material allegations of the bill and should not be used where facts are alleged which, if not controverted, would show a liability on the part of the defendant. Usually, therefore, it accompanies an answer, and the two pleadings are considered together. See PLEADING.

(4) In patent law, a properly attested writing stating that the one who executes it is a patentee of a certain invention, and that he has discovered since filing his claim that he was not the first inventor of, and therefore wishes to eliminate from his claim a part of the thing which he originally included, through mistake or inadvertence, in the specifications, or statement of the nature and object of his invention. This should be attested by witnesses and filed and recorded in the Patent Office, and it is then considered as a part of the original specifications. The part which he seeks to retain must be clearly separable and distinguishable from the part eliminated, and still be a patentable invention. Fraud or deception in making his original applications will prevent a patentee from taking advantage of this rule. See INVENTION; PATENTS; SPECIFICATION.

DIS'CO, or DIS'KO. A large island off the west coast of Greenland, in latitude 70° N. (Map: Arctic Regions, H 7). It is separated by a narrow channel from the Nugsuak Peninsula, and from the mainland on the south and east by Disco Bay. Disco Fiord deeply penetrates it from the west. The island has more than 3100 square miles, and rises over 3000 feet. Godhavn, or Lievely, on the south coast, is the seat of the Danish administration for Northern Greenland, and has about 200 inhabitants.

DISCOB'OLI (Neo-Lat. nom pl., from Gk. *δισκοβόλος*, *diskobolos*, discus-thrower, from *δίσκος*, *diskos*, discus + *βάλλειν*, *ballein*, to throw). A group of fishes characterized by the union of the rudimentary ventral fins to form the bony centre of a ventral sucking-disk, enabling its possessor to attach itself to other objects. As now defined the Discoboli include two or three families, and about fifty species, inhabiting the northern seas, of which well-known examples are the lumpsuckers (q.v., for illustrated details). Cuvier included the remora, a fish now placed in another group.

DISCOB'OLUS (Lat., from Gk. *δισκοβόλος*, *diskobolos*). The thrower of the discus (q.v.). The most celebrated statue of a discobolus was executed in bronze by the Athenian sculptor Myron (q.v.). It is known from several marble copies, the best of which is a life-size statue in the palace of Prince Lancelotti at Rome. The statue represents the athlete at the moment of greatest muscular tension, when, having swung the discus back to the full stretch of his arm, he is about to hurl it forward with all his strength. Another celebrated marble copy is in the Vatican.

DIS'COGLOS'SIDÆ (Neo-Lat. nom. pl., from Gk. *δίσκος*, *diskos*, discus + *γλῶσσα*, *glōssa*, tongue). The disk-tongued frogs, a small family having many peculiarities of structure, prominently the disk-like form of the tongue, and the fact that in the advanced tadpoles the breathing pore is in the middle of the under surface of the body instead of on the left side. The painted frog (*Discoglossus pictus*) of southern Europe is a typical form, and other representatives are the feuerkröte (q.v.), the African midwife-frog (q.v.) and others of the genus Alytes, and a small species (*Liopelma Hochstetteri*), of New Zealand, notable as the only amphibian native to those islands.

DIS'COMYCE'TES (Neo-Lat. nom. pl., from Gk. *δίσκος*, *diskos*, discus + *μύκης*, *mykēs*, fungus). A group of the Ascomycetes (q.v.), one of the classes of fungi.

DISCOPH'ORA. See JELLY-FISH; MEDUSÆ.

DISCORD (OF. *descorde*, Fr. *discord*, It. *discordia*, *scordia*, from Lat. *discordia*, from *discors*, inharmonious, from *dis-*, apart + *cor*, heart). Sounds that have no harmonical relation whatever; differing from dissonance (q.v.), which in musical language is applied to sounds that are in grammatically correct relation to one another, though not consonant. Discord is sometimes wrongly used for dissonance.

DISCORDIA. In Roman mythology, the goddess of strife, known to the Greeks as Eris.

DISCOUNT (ML. *discomputus*, from *discomputare*, to discount, from Lat. *dis-*, apart + *computare*, to reckon, from *com-*, together + *putare*, to cleanse, from *putus*, pure). A deduction from a stated price, or from a sum due at a future time. Merchants often deduct a certain sum from an account if payment is made before the bill is due. Business houses commonly publish price lists which, in course of time, are corrected by means of stated discounts. Even double and triple discounts are common. Thus 10 per cent. off 20 per cent. off 40 per cent. means a reduction of 40 per cent. from the list price, and a reduction of 20 per cent. from this amount, and finally a reduction of 10 per cent. from this result. Such discounts are called *trade* or *commercial* discounts.

Banks, in purchasing promissory notes before they are due, customarily deduct from the amount of the note at maturity a certain per cent., called *bank* discount. In case of loans it is customary for banks to deduct the interest in advance, leaving the borrower an amount equal to the face of the note less the interest. The form of discount known as *true* discount is now practically obsolete. It was computed thus: Divide the future worth of the note, i.e. its amount at maturity, by the future worth of one dollar, and the result is the present worth of the note. The difference between the future and present worth is the true discount. By discount is also meant the depreciation expressed as a rate per cent. of the par value of a fixed investment; e.g. on railway stock bought at 115 and sold at 95, there is 20 per cent. discount. The rates of bank discount vary according to the demand for money and the nature of the security. The range in the United States is approximately from 3 per cent. to 10 per cent., except in case of doubtful securities, when higher rates are exacted.

DISCOVERY (from *discover*, OF. *descovrir*, Fr. *découvrir*, It. *discoprire*, from ML. *discooperire*, to discover, from Lat. *dis-*, away + *cooperire*, to cover, from *co-*, together + *operire*, to cover) OF TERRITORY. As the foundation for claim of title this has ceased to be of practical importance with the disappearance of unexplored regions, and has given place to occupation as a means of conferring proprietary rights. International law considers discovery to give only inchoate title, which must be completed by occupation by settlement or military posts within a reasonable period, and the untimely interference of another State with the territory affected might justifiably be construed as a hostile act. What acts are sufficient to effect absolute title, and what is a reasonable time, can only be determined by consideration of the circumstances of each particular case. For instance, the act of discovery is valid until a proper time has elapsed for the preparation of an expedition for permanent occupation. But this presumption ceases when standing alone, compared with acts of continuous or actual settlement by another power. Where exploration is made and other evidence of interest given, the extinction of the claim may be long postponed unless confronted by a definite act of appropriation by another State without protest. So, in conclusion, it may be said that the intention of a State to take possession of territory discovered by its subjects must be promptly signified in some unmistakable manner, if it is to be available against foreign interests seeking a foothold. The same rule applies to occupation as a root of title.

The titles which Spain and Portugal first claimed in the New World were founded on Papal grants. In 1493 Alexander VI. granted to Spain all lands beyond a line 100 leagues west of the Azores. This was later modified by treaty with Portugal fixing a new line 370 leagues west of the Cape Verde Islands. Such claims were disregarded by the Protestant States, which sent out agents commissioned to discover and acquire any 'heathen lands.' These discoveries were made the basis of claim of title absolute, and were of practical value in giving significance to subsequent acts in themselves doubtful or inadequate. The discovery was followed by some formal act of possession in the planting of a flag or erection of a monument as notice of the intention of the State to whom the expedition belonged. The claims based on these discoveries and confirmed by later occupation and settlement developed the conflicts which have marked the history and determined the possession of the Western Continent. Writers on international law uniformly hold that discovery must be made by authorized agents of a State or that such act be promptly adopted by the Government. This was declared to have been the weakness in the American case in the Oregon Question (q.v.). Captain Gray entered the mouth of the Columbia River in 1792 in a trading vessel. No recognition was made by the United States Government at the time, and shortly afterwards Captain Vancouver, engaged in surveying the coast for the British Government, sailed several miles up its course. In 1811 the fur-trading post of Astoria was founded by the Pacific Fur Company, a private corporation. The dispute was settled by the Treaty of 1846 without expressly conceding the American claim. Africa furnishes almost the only territory to which the principles of discovery and occupation now have a vital application. In 1856 the United States adopted a code of rules to govern the rights of discovery of guano islands. Consult the authorities referred to under INTERNATIONAL LAW.

DISCOVERY, BILL OF. An equitable remedy which is sometimes used to enable a plaintiff or defendant in an action, either at law or in equity, to obtain information and proof as to facts and documents necessary for the prosecution or defense of his case, where such means of proof are within the knowledge or possession of the opposite party. The bill should not ask for any relief as to the matters in controversy, but may ask for an injunction staying further proceedings in the action until the discovery is obtained. It must only ask for the disclosure of facts or the production of deeds, writings, or other things in which the party has a title or interest, and which are essential to be established in order to sustain his side of the case, and must show some merit in his claim or defense. Thus a devisee of real property under a will might maintain such a bill for the production of the title deeds of the particular property to which he has become entitled, in order to trace the devisor's interest, and consequently enable him to establish his claim. It must not demand any information which is clearly only in the nature of evidence for the opposite party, as it is not for the purpose of compelling him to disclose the manner in which he will endeavor to establish his side of the case. It will only be entertained in civil actions. It is still a common remedy in States having distinctly separate courts of law and equity, but has been abolished or has fallen into disuse in States having codes of civil procedure, as in New York, where a party has a right to call his adversary as a witness and compel the production of books and documents by *subpœna duces tecum.* See Equity; Evidence; Subpœna.

DISCOVERY, The. (1) The small ship in which Henry Hudson explored the northeastern coast of America in 1610. The vessel was later commanded by Sir Thomas Button, who discovered Nelson's River, and still later (1615-16) by Baffin and by Bylot. She was originally built (1602) by the East India Company, to discover the 'Northwest Passage' under the command of George Waymouth. (2) A steam-vessel employed, together with the *Alert,* on the British Arctic expedition, 1875-76, under Sir George Nares.

DISCRIMINANT. See Equation; Determinants.

DISCRIMINATION (Lat. *discriminatio,* from *discriminare,* to discriminate, from *discernere,* to discern, from *dis-,* apart + *cernere,* to perceive). A distinction made between patrons by one engaged in a public or common calling, such as that of common carrier, or farrier, or innkeeper. It is discountenanced by the common law. It is the legal duty of every one engaged in such a calling to serve all patrons in the order in which they present themselves, and to charge no one more than a reasonable rate. He has no right to pick and choose among them. Speaking generally, he must treat all alike; that is, he must afford equal accommodations and facilities to all, and he must not exact from any one an excessive rate for his services. Further than this, however, his common-law duty does not extend. He is at liberty to charge less than a fair rate to any one. Others, it is held, cannot justly complain of such favoritism, so long as his charges to them are reasonable in amount. In the language adopted by the New York Court of Appeals: "Respecting preference in rates of compensation, the carrier's obligation is to charge no more than a fair return in each particular transaction, and, except as thus restricted, he is free to discriminate at his pleasure. This is the equal justice to all which the law exacts from the common carrier in his relations with the public." To put it in another way, the common law prohibits positive discrimination, but does not forbid negative discrimination. It does not permit the common carrier to transport one man's goods in preference to those of another; but it does allow him to carry for favored individuals at an unreasonably low rate, or even gratis.

When railways came into operation their managers took advantage of this rule of the common law, and made especially low rates for those who gave them their exclusive patronage, as well as for those whom they chose for any reason to favor. This practice has evoked a good deal of legislation, both in England and in the United States, having for its object the prohibition of every form of discrimination or preference by carriers. The earliest statute on this subject is the act of Parliament known as the Railways Clauses Consolidation Act of 1845. Its main purpose was to prohibit a common carrier from charging more to one person than, during the same time, it charged to others for the same kind of service. It has served as the model for Federal and State statutes in the United States. In some of the States its policy has been imbedded in constitutional provisions. For example, the Constitution of Colorado contains this language: "All individuals, associations, and corporations shall have equal rights to have persons and property transported over any railroad in this State, and no undue or unreasonable discrimination shall be made in charges or in facilities for transportation of freight or passengers within the State, and no railroad company, nor any lessee, manager, or employee thereof shall give any preference to individuals, associations, or corporations in furnishing cars or motive power." This is a sound public policy. It operates to prevent great railroad corporations from building up the business of favored individuals and injuring others.

The most important piece of Federal legislation bearing on this topic is best known as the Interstate Commerce Act of 1887. Its avowed purpose is to promote and facilitate commerce by the adoption of regulations to make charges for transportation just and reasonable, and to forbid undue and unreasonable preferences or discriminations. The evils which it was intended to correct have been judicially described as ordinarily taking "the shape of inequality of charges made, or of facilities furnished, which are usually directed by or tolerated for the promotion of the interests of the corporation itself, or for the benefit of some favored persons at the expense of others, or of some particular locality or community, or of some local trade or commercial connections, or for the destruction or crippling of some rival or hostile line." The act does not attempt, however, to prohibit all discriminations and preferences. It aims only at those which are unjust and unreasonable. It does not ignore the principles that one can sell at wholesale cheaper than at retail, nor that the carrier should be allowed to make a specially low rate to secure business which would otherwise go by other competitive routes. For later legislation, including that of 1906, see Railways.

See *Interstate Commerce Commission* and authorities there cited. Also, Beale, On Bailments, chap. xi. (London, 1900); *Interstate Commerce Commission* vs. *Baltimore and Ohio Railroad,* 145 U. S. 263 (1892); *Texas and Pacific Railway* vs. *Interstate Commerce Commission,* 162 U. S. 197 (1896).

DISCRIMINATION, Sensible, or Differential Sensitivity. The name applied to an intellectual function of extreme importance—our capacity to pronounce upon the likeness or difference of sense-presentations. The phrase "must not be taken to denote a faculty of comparison, in the sense of a peculiar conscious process existing alongside of the various contents. It merely expresses, in the first instance, the general fact that we have different experiences and experience them differently; in other words, it covers the introspection (q.v.) of different contents and the report of their difference. . . . But we also use it to indicate our experience of like contents, and our report of their likeness" (Külpe). The differential sensitivity would, then, be exercised if we were called upon to judge of the likeness or difference of two reds, or of the *a* of two violins. In such cases, we (a) experience the colors and tones in the same or in different ways; they make the same or a different impression upon our mind; while we then (b) formulate this experience in words, saying 'like' or 'different,' as introspection dictates. The former process, of introspective discrimination, is termed the *direct*, the latter, of rendering the experience in words, the *indirect* differential sensitivity. There are, then, two problems before us. We must ask, first, as to the conditions under which we are able to discriminate, and the limits within which discrimination is valid; and, second, as to the adequacy of language to reflect or reproduce the results of introspection.

(1) A very little consideration suffices to show that an accurate comparison of sense-contents cannot be undertaken in any and every case of difference; but that certain favorable conditions are necessary to a reliable judgment. Suppose, e.g. that we have two reds before us—a saturated red, and a reddish gray of the same brightness. (See SATURATION.) It is impossible, with all imaginable care in comparison, to assert that the saturated red is three or four or any definite number of times as red as the less saturated color. The one impression is that of a 'good' red; the other that of a dull or gray red; more we cannot say. Or suppose that three pressures are given, a light, a moderate, and a heavy. It is impossible to assert with any confidence that the moderate pressure is three times as much heavier than the light as the heavy is than the moderate; we can say that the former difference is 'a good deal greater' than the latter, but that is all. Now experiment has proved that the conditions favorable to exact discrimination are realized in two, and only in two, instances; and it is, accordingly, with these that investigators of the differential sensitivity have occupied themselves. The first instance is that of 'difference determination,' the second is that of 'difference comparison.' In the former procedure, the psychologist aims to determine the 'just noticeable difference' between two like contents; in the latter, to effect an equality of sensation-differences or sense-distances. An illustration of difference determination appears under the title AUDITION (q.v.); it is found that two tones are discriminable, in the middle region of the musical scale, if their pitch-numbers differ by 0.2 of a vibration. This value measures the just noticeable difference of tonal quality. As illustrations of difference comparison, we may take the following: given two tones, it is required to find a tone which lies, for sensation, midway between them; and, given a black and a white, it is required to find a gray which appears to be equidistant from both. Let the tones have, e.g., the pitch-numbers 200 and 400; then the middle tone has (approximately) the pitch-number 300; the stimulus-distance 300-200 is equal, in sensation, to the stimulus-distance 400-300. In other words, we have the required middle tone when we have the *arithmetical mean* between the two tonal stimuli. With brightnesses the case is different. Let the unit of black have the photometric value 1, and the unit of white the photometric value 60; so that a white disk (360°) stands to a black disk as 360 × 60 to 360 × 1, or as 21,600 to 360. The middle gray is not the arithmetical mean, a disk of 180° white and 180° black (value 10,980). This mixture appears much too light. The middle point is found rather with a disk of some 41° of white and 319° of black; i.e. with a stimulus whose photometric value is approximately 2788, the *geometrical mean* between the limiting black and white. It is clear, then, that the course of the differential sensitivity is not the same for tones and for brightnesses. By an extension of experiment to the qualities of the other senses, and to the sensation-attributes other than quality (see SENSATION), various laws of the differential sensitivity have been established. (For an example, see WEBER'S LAW.) A valid determination of these laws is possible only on the condition that the sources of experimental error are strictly controlled by the investigator. Attention, expectation, and practice must be at their best; habituation and fatigue must be avoided (see these terms). The 'constant errors' of time and space must also be ruled out; as many experiments must be taken in the time-order *ab* as in the order *ba*, and as many with stimulus *a* to the right as with the same stimulus to the left; and the results of the double series averaged.

So far we have spoken of the *magnitude* of the differential sensitivity. This may be expressed in two ways, absolutely and relatively. If, e.g., I can just distinguish a light of 50-candle power from one of 50.5-candle power, the value .5 gives a measure of the absolute, and the value .5/50 or 1/100 a measure of the relative differential sensitivity. But we can also measure the *delicacy* of the discriminative function. An observer might, in one test, distinguish between lights of 50 and 50.2, while in the next succeeding he could distinguish only between 50 and 50.8. Here the magnitude of the differential sensitivity, as averaged from the two tests, is .5; but the observer is evidently less delicate of discrimination than another who should give the values 50.4 and 50.6 in successive trials. Not only the average, but the fluctuation of that average, must therefore be considered in a general measure of discrimination.

(2) We turn to the question of the indirect differential sensitivity. And we must note, in the first place, that the importance of language as an instrument of psychology can hardly be overestimated. The flexibility and ready variation of the spoken sentence and the permanence of the written record are very great advantages. Still, language is discrete, while the stream of consciousness is continuous; so that, at the best, we are seeking, so to say, to reproduce a fresco by a mosaic. Moreover, the relation of the contents of consciousness to the words that describe them is not constant; while some experiences call up habitual and familiar phrases, others baffle us, cause us to pick and choose our terms, and to halt for the right expressions. We cannot, then, take it for granted that discrimination and the report of discrimination always run parallel, that the 'good observer' is necessarily a 'good reporter.' The experimental psychologist must receive a special training in the use of words; he must be taught to clothe his intro-

spection in language, as he is also taught to introspect; and the intercomparison of results which the experimental method secures must extend to form as well as to contents. Consult: Fechner, *Elemente der Psychophysik* (Leipzig, 1889); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1902-3); Kuelpe, *Outlines of Psychology* (London, 1895); Titchener, *Experimental Psychology* (New York, 1905).

DIS′CUS (Lat., from Gk. *δίσκος*, *diskos*, disk) **THROWING.** An athletic sport. Originally, a circular piece of stone (sometimes metal) about twelve inches in diameter, which the *discobolus* (Gk. δισκοβόλος) or thrower of the discus in the ancient Greek games pitched from a fixed mark to the greatest possible distance; the competition of rival athletes constituting the game. Discus-throwing was one of the five exercises of the pentathlon. In the modern game, as played in America and England, the discus weighs four pounds and seven ounces, and is thrown from a box nine feet square—the throw being measured at right angles from the front of the box. When the throw is at either side, it is measured from a line projecting from the front line. No part of the person of the competitor is allowed to touch the outside of the square, but the contestant may assume any position in throwing.

DISEASE, dĭz-ēz′. "Any departure from, failure in, or perversion of normal physiological action in the material constitution or functional integrity of the living organism" (Foster's *Medical Dictionary*). Practically, a disease is a particular condition of ill health dependent upon some cause other than normal decay from age. Convenient, though not strictly scientific, is the division of diseases into functional and organic. A disease is organic if a certain organ is affected by it, changes occurring in the tissues. In a functional disease the organ in question does not properly perform its functions, but is itself intact; properly, the disease exists elsewhere than in that organ, the organ being disordered as a reflex result of distant changes. Diseases are termed diathetic when dependent upon a predisposition or diathesis (q.v.); they are termed enthetic when arising from external causes entirely. Many diseases arising from the entrance and growth of bacteria from without are called germ diseases. Autogenous diseases are those caused by altered activity of the cells of the body. This altered function may be due to the action of bacteria, which are naturally found in the body, as in the digestive tract. The retention of fæces in the intestine, or of uric acid or peptones and albumoses in the blood, causes disease from the generation of poisonous alkaloids termed leucomaïnes. See BACTERIA; DISEASE, GERM THEORY OF; MEDICINE; DISTRIBUTION OF DISEASES.

FEIGNING OF DISEASE. This is much practiced in the army and navy, and by convicts and others anxious to escape from discipline, or procure a discharge from compulsory service. It is also practiced by unfortunates who want to rest in hospitals during the winter, or by impostors who seek to gain money by arousing sympathy. It is technically called *malingering*. The detection of feigned disease, of course, necessarily belongs to the educated physician, and is impossible without a thorough knowledge of the reality, unless, indeed, the imitation be very coarse and badly studied. The diseases most commonly simulated are epilepsy, catalepsy, convulsions, blindness, deafness, paralysis, insanity, neuralgia, rheumatism, disease of the heart, and generally all disorders which may exist without leading to any distinct external appearances. Ulcers of the legs, however, have often been made, and kept open artificially through the application of irritant substances, and vomiting or coughing up of blood is very easily simulated. The detection of such impostures is easy or not according to the opportunities and knowledge and skill of the deceiver, as compared with those brought to bear on the discovery of the fraud. Careful testing is always necessary, as well as observation of the patient when he is unconscious of it. The medico-legal importance of this subject is decided. Many actions are brought against railroad companies to recover damages for alleged injuries resulting in nervous diseases. It rests with the neurologist to decide if such diseases exist, and none but an expert can determine the truth. The questions then arise whether the nervous disease existed before the injury, or whether it was aggravated by the injury so as to incapacitate the patient, or whether it has appeared since the injury and is due to a subsequent cause. For a consideration of the question and an account of a family of malingerers, consult Bailey, *Diseases of the Nervous System resulting from Accident and Injury* (New York, 1906).

DISEASE, GERM THEORY OF. The theory that several enthetic diseases are caused by entrance into the body of germs of a vegetable nature, which during their growth produce chemical changes and give rise to chemical products. These chemical products, like other poisons, alter functions, disturb the processes of nutrition and repair, and cause disease. The germ theory, in a less accurate form, was proposed by a few investigators as early as the seventeenth century. (See BACTERIA.) Van Leeuwenhoek's discovery and description of the micro-organisms which his imperfect optical instruments brought into view interested Lange and Hauptmann, who theorized at once on the important rôle the miscalled 'animalcules' might play in the production of disease. Among the maladies which they considered to be probably due to *contagium animatum* were epilepsy, gout, pleurisy, typhus fever, measles, smallpox, and puerperal fever. In 1701 Andry and Linné announced that syphilis has a similar origin. Lancisi, in 1718, made a parallel claim for malaria. Following these most valuable deductions and theories came the publication, in 1762, of the results of the investigations and deductions of Antonius Plenciz, a Viennese physician, who declared that all infectious diseases were caused by micro-organisms, and that the infective material consisted of either minute living animals or plants, letting a flood of light upon the whole subject through these brilliant discoveries of the truth. He stated his belief that differences in the length of the period of incubation of diseases were due to differences in the time of development of special germs, as they multiplied in the body. He suggested the conveyance of germs through the air. He made original investigations into the nature of the processes of putrefaction and fermentation, and stated as a conclusion reached by his deductions, that such processes result from the presence, growth, and multiplication of living organisms. Following the publication and discussion of these statements arose the theory of spontaneous generation of minute animal and vegetable organisms, advocated by Needham, in 1749, after loosely conducted experiments. Bonnet, in 1762, Lazarus and Spallanzani in 1769, Schultze in 1836, Schwann in 1837, Helmholtz in 1843, Schroeder and Von Dusch in 1854, Hoffmann in 1860, Chevreul and Pasteur in 1861, all contributed results of accurate scientific experiments which showed the absolute falsity of the theory of spontaneous generation. But, incredible as it may now seem, it was not till 1876 that the combined results, philosophical, chemical, and biological, of Tyndall and Cohn set the question at rest and established the fact that "all life comes from life," to use the words of Harvey's law. About 1873 the germ theory of disease was authoritatively restated, and germ causation became an accepted principle.

Germs in the Body. The question as to how germs enter the body and the means of defense against them which the body possesses is one of extreme importance. When we think of the omnipresence of germs, in the air we breathe, in the water we drink, in much of the food we eat, in the soil upon which we walk, in fact in or upon almost everything we touch or with which we come in contact, the question why bacteria do not oftener enter the body tissues would seem to be more rational than why they sometimes do so enter. Fortunately most germs are harmless; but many are capable of producing the most severe forms of disease. There are constantly present in the mouth, nose, and upper air-passages, as well as throughout the entire gastro-intestinal canal, micro-organisms which, under ordinary conditions, are perfectly harmless. Then, too, the body is so built as to offer very powerful resistance to the entrance into it of most germs. First in importance of the body defenses against germ invasion is the skin. The unbroken skin offers an almost impassable barrier to the passage of most forms of germs. Being the most exposed, it is also the strongest of the body defenses against the entrance into it of micro-organisms. Few, if any, germs have the power to penetrate it, if healthy and intact. Any person accustomed to dissecting, operating, or performing autopsies with ungloved hands, noting with what impunity highly infectious material may be handled provided there is no broken surface, and how serious are often the results of an overlooked wound or a chance scratch, realizes the importance of the skin as a protection against germs. There are, however, certain normal openings in the skin. These are: (a) those of the digestive tract—the mouth and anus, communicating with the œsophagus, stomach, intestines, and rectum; (b) those of the respiratory tract, the mouth and nose—leading into the larynx, trachea, bronchi, and lungs; (c) those of the genito-urinary tract, the urethra and vagina—leading to the bladder, ureter, kidney, uterus, and Fallopian tubes; (d) the eye. These openings and tracts are lined by mucous membranes which may be considered as forming a second line of defense against germ invasion. Being less exposed than the skin, the mucous membranes are also less resistant than the skin to the entrance of germs. Indeed, to certain species of germs the mucous membranes are especially susceptible; as the mucous membrane of the intestine to the bacillus of typhoid fever, that of the respiratory tract to the diphtheria bacillus and to the bacillus of pneumonia, and that of the genito-urinary tract to the gonococcus. To a great many of the most dangerous species of germs, however, the healthy mucous membrane, like the unbroken skin, presents an impassable line of defense. Nor is the body helpless against the activities of germs even after they have entered its tissues. While the lymphatic system often furnishes the channels by means of which germs are carried from one part of the body to another, the lymphatic glands themselves undoubtedly act as filters arresting the progress of the germs, while the lymph-cells probably possess certain germ-destroying powers. Then, too, the white corpuscles of the blood are endowed with properties which enable them to take up germs and destroy them. It is largely for this purpose, in all probability, that the white blood-corpuscles leave the vessels and pass out into the surrounding tissues in inflammatory conditions. Certain other cells probably possess this same power of destroying germs. Such cells are known as *phagocytes*, and the process of germ destruction by them is called *phagocytosis*. There are also developed in the body during the progress of germ infections certain substances which appear to be in solution in the fluids of the blood. These substances are known as antitoxins (q.v.), and have a distinctly inhibitory effect on the further development of the germs.

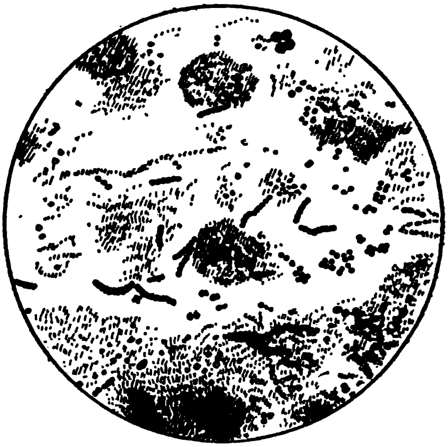
The effects upon the body mechanism of the activities of disease-producing germs vary, of course, greatly for the different germs. Certain general modes of action may, however, be mentioned. (1) The direct (usually local) effect of the presence of the germs. Thus, in diphtheria the direct local effect of the germ in the throat is death of parts of the mucous membrane and the formation of what is known as a false membrane. In a similar manner the ulcers in the intestines in typhoid fever are due to the direct local action of the typhoid bacillus. Another local effect which germs may sometimes have consists in the formation of infectious emboli in different parts of the body. Thus, for instance, in infectious endocarditis with bacterial growth in the heart valves, a little mass of bacteria may become detached, and carried through the circulation until it reaches a vessel too small for it to pass through. Here it stops, forming an infectious embolus and thus setting up a new focus of infection. (2) The production of toxins (q.v.). These are poisons produced in the body by the activities of bacteria. They seem to be largely present in the plasma of the blood and are consequently distributed throughout the body. It is to these toxins that the systemic symptoms of an infectious disease are due, e.g. the fever, prostration, delirium, etc. These toxins differ for different bacteria, a particular toxin probably being specific for each species of germs. That a disease may be accepted as positively proved to be of germ origin, it must fulfill certain very rigid conditions. One single species of germ must always be found present in the diseases. This germ must not be found regularly in connection with any other disease. It must be possible to cultivate this germ artificially, and to separate it in what is known as a pure culture, i.e. a growth of this germ absolutely free from any other living substance. It must be possible to induce the same or a similar disease in animals by injecting them with this pure culture. Comparatively few diseases as yet fulfill all of these requirements. Among the most important of the diseases which have been proved to be of germ origin may be mentioned anthrax, actinomycosis, Asiatic cholera, bubonic plague, acute cerebrospinal meningitis, diphtheria, erysipelas, glanders, gonorrhœa, influenza, leprosy, malaria, pneumonia, relapsing fever, tetanus, tuberculosis, and typhoid. Of the more important of the diseases which from their behavior are believed to be of germ origin, but in which the germs have not as yet been found, are hydrophobia, measles, scarlet fever, smallpox, typhus, and whooping-cough.

Bacteriological Technique. In many cases of disease a determination of the species of bacteria present may be made by means of a bacterial examination of pathological material during life. This is done in one of three ways: first, by cover-glass preparation; second, by culture; third, by animal inoculation. In some cases a little pathological material may be obtained on a sterilized platinum loop; in others a piece of absorbent cotton wound about a stiff wire and forming a 'swab' is used, by means of which pus or exudates may be obtained and transported in a sterile test-tube into which the swab is thrust; in still other cases fluid material may be obtained by aspiration. A cover-glass preparation is thus made: A very small amount of material is smeared over a cover-glass in such a way as to leave streaks of it and not a continuous layer. After being dried by being held in the fingers, charged side uppermost, over a Bunsen burner, it is passed rapidly three times directly through the flame of the burner by means of a forceps, to 'fix' it. The cover-glass is then held in the grasp of the forceps, charged side up and level, and the chosen staining fluid is dropped on it from a dropping bottle, till it is completely covered. The cover-glass is then heated over the flame and washed in water, and any other necessary processes are concluded, according to the method of staining employed. The cover-glass with the charged side down, and wet thoroughly with water, is placed on a microscopic slide, and the excess of water is removed by means of filter paper in the usual way. An oil-immersion lens is then used, for examination of the specimen.

Culture mediums differ in different cases. Potato, agar-agar, litmus-milk, glucose agar-agar, and glucose gelatin are used; but the best culture medium for general purposes is coagulated blood serum. At the slaughter-house blood is obtained as it runs from the vessels of the beeves, preferably that which flows from the carotid artery, as it clots more quickly. The jar in which it is received is left in a cool place for twenty-four hours. After a few hours the clot is gently loosened from the sides of the jar, to facilitate its contraction, and after this the jar is not agitated. After about twenty-four hours the serum is removed with a pipette. Three parts of blood serum and one part of glucose bouillon are mixed to form the culture medium, which is run into test tubes in small quantities. The tubes are placed in a tilted position in the hot-air sterilizer and when withdrawn the serum is found to be coagulated in a slanting position. Material obtained on a 'swab,' e.g. from the throat of a suspected diphtheria patient, is lightly smeared over the whole exposed surface of the blood serum in a culture-tube. The culture-tube is then placed in an incubator or thermostat, and the bacteria are allowed to grow on the nutrient surface, for subsequent examination with the microscope.

Animal inoculations are made as follows: A small piece of suspected material may be inserted under the skin of a mouse by means of a platinum wire, or a little fluid may be injected under the skin of a guinea-pig or rabbit. After the death of the animal an autopsy is made, and various organs and tissues are examined microscopically.

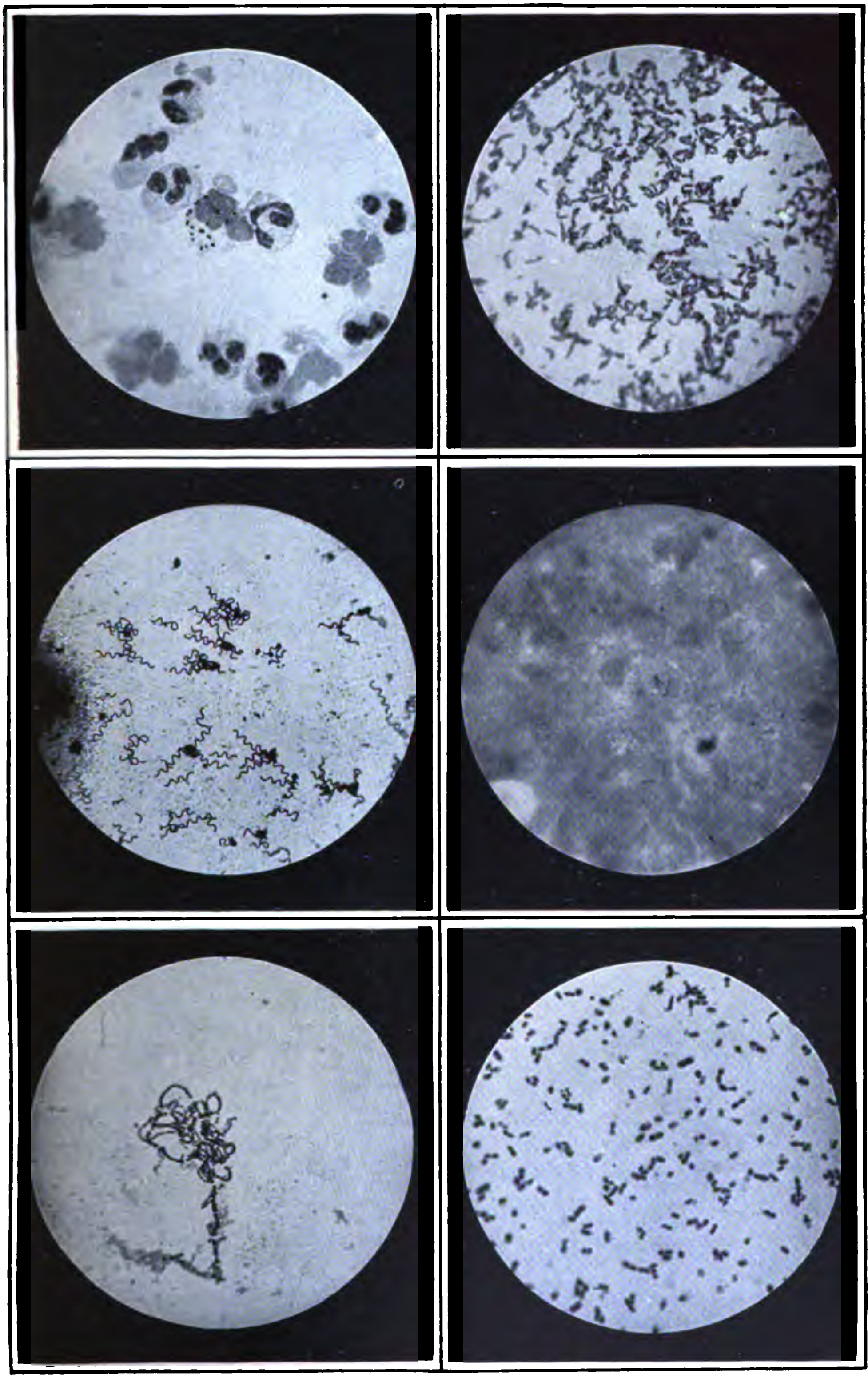
Special Examinations. In examining sputum for tubercle bacilli, a cover-glass preparation is made from a dense grayish-white particle taken from the morning sputum. The tubercle bacillus is a slender rod varying from 1.5 micromillimeters to 4 micromillimeters in length, and about 0.4 micromillimeter in breadth, generally slightly curved. The bacilli occur singly, though in cultures they are sometimes found in chains of four to six links. Club-like forms and branches have been seen also. It must be differentiated from the smegma bacillus, Lustgarten's bacillus of syphilis, and certain others.



SPUTUM CONTAINING TUBERCLE BACILLUS (X 1000).

In examining for the bacillus of diphtheria, a blood-serum culture-tube is inoculated by means of a 'swab' with exudate from the tonsils of the patient, and is placed in the incubator for about fifteen hours. The resulting growth is examined by means of a stained cover-glass preparation. Mounted on a slide, the specimen is examined with a high-power lens. The bacilli will be found to be of varying size, from 1 to 6 micromillimeters long and 0.5 to 1 micromillimeter broad, straight or slightly curved, with rounded ends, singly or in pairs. The ends may be enlarged. Irregular forms are common. Clusters or bundles and rarely branching forms are found. For the detection of the plasmodium of malaria, a fresh specimen of blood is taken from the lobule of the ear, and received on a cover-glass. This is inverted on a slide so as to spread the specimen evenly, and all superfluous blood is removed. Fixation may be secured by heating, or by im-

DISEASE GERMS



1. **GONOCOCCUS** in Pus Cells (Jenner Stain; F. C. Wood).
2. **BACILLUS KLEBS-LOEFFLER OF DIPHTHERIA** (Sulphuric Acid; Iron Alum, Haematoxylin; Leaming).
3. **BACILLUS TYPHOSUS** with Flagella (Van Ermengen's stain).
4. **BACILLUS TUBERCULOSIS** in Sputum (Eosin, Methylen blue).
5. **STREPTOCOCCUS PYOGENES** in Chains (Sulphuric Acid, Iron Alum, Haematoxylin; Leaming).
6. **PNEUMOCOCCUS** in Capsules (Copper Sulphate Method of Hiss)

mersing in a mixture of absolute alcohol and ether. The preparation is stained to secure contrast between the parasite and the blood-disks. Under the microscope, the plasmodic appear about the size of red blood-corpuscles, discoid, star-shaped, in odd forms with prolongations, flagellæ and branches, nucleated, granular, etc. If not fixed, the parasites show rapid amœboid movements in a fresh preparation. Other micro-organisms are described under the titles of the diseases they cause. Consult: Friedländer, *Mikroskopische Technik* (Berlin, 1900); Thoma, *Lehrbuch der pathologischen Anatomie*, trans. by Bruce (London, 1896); Günther, *Bakteriologie* (Leipzig, 1898); Abbott, *Principles of Bacteriology* (Philadelphia, 1905); Mallory and Wright, *Pathological Technique* (Philadelphia, 1904); Sternberg, *Bacteriology* (New York, 1901); Park, *Bacteriology* (New York and Philadelphia, 1900); Bowhill, *Bacteriology* (Edinburgh, 1899); Newman, *Bacteriology and The Public Health* (Philadelphia, 1904); Muir and Ritchie, *Manual of Bacteriology* (New York, 1903). See BACTERIA; MICROSCOPY; MALARIA.

DIPHTHERIA BACILLUS FROM TRACHEA (X 500).

DISEASES OF ANIMALS. In the general discussion of the diseases which affect animals, various systems of classification have been adopted by different writers. The scheme here presented is that most commonly adopted. Animal diseases may be grouped under the following five heads: (1) infectious; (2) poisoning; (3) constitutional; (4) organic; and (5) diseases caused by animal parasites. Infectious diseases are due to the action of minute organisms (bacteria) in the blood or vital organs and tissues. Such diseases may be communicated from one animal to another by means of infected blood, by tissues, or by animal secretions containing the disease-producing organism.

The most important infectious diseases of animals are abortion, actinomycosis, contagious agalactia, anthrax, asthenia, blackleg, braxy, cattle-plague, cerebro-spinal meningitis, dog distemper, foot-and-mouth disease, fowl cholera, glanders, influenza, contagious pleuropneumonia, rabies, roup, swine-plague, tetanus, Texas fever, and tuberculosis. Each of these is discussed in a separate article. These diseases are due to the action of bacteria, with the exception of Texas fever, which is caused by an animal blood parasite, and rabies, of which the causative agent has not been determined.

Under diseases of poisoning are included cases of poisoning of an acute or chronic nature by mineral, plant, or animal poisons. The more common mineral poisons to which animals may gain access are compounds of arsenic, lead, copper, zinc, phosphorus and mercury, mineral acids, and caustic alkaline substances. Among plant poisons mention may be made of strychnine, opium, aconite, and various wild plants, such as water-hemlock, larkspur, loco, veratrum, death-camass, and lupine. The eating of large quantities of ergot produces the symptoms of ergotism (q.v.). Smuts and molds sometimes cause digestive disturbances of a more or less serious nature. Animal poisons include snake-poison, bee-stings, and the sting of certain other insects, such as the tsetse-fly, buffalo gnat, etc.

Diseases caused by animal parasites include those which are produced by parasitic worms, insects, mites, etc. Every species of domestic animals is infested to some extent with parasitic round or flat worms. The lung and stomach worms (q.v.) of sheep are periodically the cause of great losses to the sheep industry. The fluke-worm, which causes liver-rot (q.v.) of sheep and other animals, is of great economic importance. The nodular disease of fowls is due to the presence of tapeworms in the walls of the intestines. Trichinosis of hogs is due to infestation by the round worm, trichina. Beef and pork measles are conditions produced by the presence of tapeworms in an immature condition in the meat. The kidney-worm, which usually lies imbedded in the fat tissue of hogs, occasionally penetrates the kidney and causes death. Besides the examples already given there is a considerable variety of round and flat worms which infest the intestines of domestic animals without causing any marked disturbance except when present in unusually large numbers.

Nearly all domestic animals are subject to mange or scab. This disease is due to the attacks of various species of mites. One species with several varieties causes one form of scab on sheep, cattle, horses, and goats. A few species of flies live, during a portion of their life cycle, as parasites on or in animals. Chief among these are the horse bot-fly, sheep bot-fly, ox warble-fly, and horn-fly. The last three occasionally cause serious disease. Various species of ticks and fleas are well-known pests on domestic animals.

Under the head of constitutional diseases reference is ordinarily made to such pathological conditions as anæmia, scurvy, and diabetes, which occasionally prevail in animals as well as in man.

The term 'organic diseases' includes diseases of the skin, digestive organs, respiratory organs, circulatory organs, nervous system, and urinogenital organs. Some of the numerous diseases which fall in this category are infectious.

It will be understood that the system of classification here proposed cannot be followed too strictly, and that the different categories are not mutually exclusive. The various forms of scab and itch may readily be transmitted from one animal to another by contact, and are, therefore, contagious. The terms infection and contagion, however, usually have reference to diseases which are due to the action of bacteria.

Of the chief infectious diseases of animals, actinomycosis, anthrax, glanders, foot-and-mouth disease, rabies, tetanus, and tuberculosis may be transmitted to man.

DISEASES OF PLANTS. In addition to being of great scientific interest, diseases of plants are of immense economic importance. Losses running into millions of dollars have been caused in different countries by certain plant diseases. In Australia the wheat-rust often greatly depreciates the wheat crop; phylloxera has ravaged the vineyards of France; potato-rot is held partly responsible for some of the famines in Ireland; mildew and black rot are serious enemies to grape culture in America, and in parts of California grape-growing has been abandoned on account of disease. While the occurrence, though not the causes, of many plant diseases has long been known, their definite study (phytopathology) has been developed since about 1885. Since that date our knowledge of the causes of diseases and of the means of preventing them has been growing with remarkable rapidity, and no country has added more to this information than the United States, through the plant pathologists of the Department of Agriculture and of the several agricultural experiment stations.

For ordinary purposes, plant diseases may be classified, according to their causes, into four categories—namely: (1) Those caused by fungi; (2) those caused by bacteria; (3) those due to nematodes and insects; and (4) those due to physiological causes.

Taking these in the order of enumeration, the diseases due to fungi are given first rank, and they are perhaps the most widely spread and destructive of all. There is hardly a crop or a species of plant that is not liable to attacks of fungi through either its roots, stem, leaves, or fruit. The spores of fungi are exceedingly minute, and through them disease is spread. They are carried everywhere by the wind, by insects, and other agencies. Finding lodgment upon a plant, if the conditions are favorable, it is attacked. Plants not in perfect physical and physiological condition offer an easy entrance to the germ tube sprouted from the spore, and the thread-like mycelium spreads the disease through the host plant, as it is called, the fungus being referred to as a parasite. All plants are not subject to the attack of the same fungi, since certain conditions render a given plant immune to some and susceptible to others; nor are all fungi parasitic, since some live usefully as saprophytes upon dead and decaying vegetation. Some fungi gain entrance to plants by sending their germ tubes through the minute breathing pores of the leaves; others dissolve their way through the cuticle by means of ferments which they secrete. Still others known as wound fungi can gain entrance only through some wound on the host plant, entrance having to be prepared for them. Once the host is attacked and the conditions of temperature and moisture favorable, the disease progresses with great rapidity, from individual to individual, and becomes a veritable epidemic. The host plant is injured in a number of ways, such as being robbed of its nourishment, having its water-supply shut off, etc. Some parasites stimulate the host to unusual growth, as may be seen in the galls, knots, and swellings, some of which are of grotesque shapes; still others produce stunted growth or destroy the host plant entirely. Many fungi which cause plant diseases are interesting on account of the fact that they exist in two forms, each of which lives upon a different plant. The phases which belong to one cannot be made to grow upon the other, but the phases of each host readily inoculate the other. This is true of the fungus causing apple-rust, the alternate form of which is found in the so-called apples of the red cedar or juniper. Different stages of one of the wheat-rusts (Puccinia graminis) are found upon wheat and upon the barberry-leaves. A disease of pine occurs in another form upon currant-leaves, and many other similar examples are well known. Familiar examples of diseases caused by fungi are the rusts and smuts of grains, potato-rot, grape-rot, clubroot, crown-gall, plum-knot, anthracnose of many plants, leaf-spots, wilt diseases, mildews, scab, etc., all more fully described under the names of their respective hosts.

The second class of plant diseases to be considered are those due to bacteria, over some of which there has been considerable controversy. Some writers deny their bacterial origin. But the investigations of Dr. E. F. Smith and others seem to prove that in a number of well-known instances bacteria are the immediate cause of disease. These investigators, by carefully conducted experiments, have succeeded in producing the diseases in question by inoculation experiments with the bacteria. Diseases of fungus origin for the most part attack certain definite portions of plants, as the leaves, fruits, etc., destroying them and indirectly affecting the rest of the plant; but the bacterial diseases, especially upon soft, herbaceous plants, attack any part of the plant and cause its sudden collapse without much delay. Prominent among the diseases attributed to bacteria may be mentioned the fire-blight of apples and pears, black rot of cabbage, a wilt disease of cucumbers and melons, a brown rot of potatoes, egg-plant, and tomatoes, a disease of sweet corn, a hyacinth disease, and a disease of celery. Most of these are fully characterized under their special names.

Among the diseases of the third class may be mentioned the phylloxera, which attacks the roots of the grape, devastating the vineyards of France, Italy, Germany, and Europe generally, wherever varieties of grapes which belong to Vitis vinifera are grown; nematodes or eelworms, which attack the roots of many plants in parts of the United States, Europe, and elsewhere, causing galls to be formed to the great detriment of the plant; and thrips and aphides, whose punctures cause a disease of carnations and doubtless many other plants.

The diseases of the last class are due to some interference with the proper exercise of the functions of the plant—by improper nutrition, too much or too little water, light, heat, etc. These functional diseases manifest themselves in a manner similar to the bacterial diseases, the whole plant being affected. For these diseases the corrective means suggest themselves, the only difficulty being the discovery of the causes.

The investigations of the past few years have led to the discovery not only of the causes of many plant diseases, but also of the means whereby they may be prevented. Cures for such diseases are not known when the plant is once badly affected, so attention is given to their prevention. Sanitary conditions are necessary to keep plants in a healthy state. In order to prevent the spread of plant diseases, all affected plants and parts should be collected and burned. All weeds and wayside plants likely to harbor the disease should be destroyed. Many diseases are spread by insects, and, as far as possible, these should be combated. Many diseases may be prevented by the thorough and repeated spraying of the plants with a fungicide (q.v.). The theory upon which these act is that the copper or other substances used are detrimental to the germination of the fungus-spores by which the diseases are spread. Experience has shown that much of the loss due to some of our most common and destructive plant diseases might have been absolutely prevented by the timely and thorough use of fungicides, and that at a cost very small indeed compared to the loss sustained.

Bibliography. Sorauer, *Handbuch der Pflanzenkrankheiten* (Berlin, 1896); Frank, *Die Krankheiten der Pflanzen* (Breslau, 1895-96); Tubeuf and Smith, *The Diseases of Plants Induced by Cryptogamic Fungi* (London, 1897); Scribner, *Fungus Diseases of the Grape and Other Plants* (Little Silver, N. J., 1890); Lodeman, *The Spraying of Plants* (New York, 1896); Massee, *A Textbook of Plant Diseases* (London, 1899); Hartig and Somerville, *Diseases of Trees* (London, 1894); Prillieux, *Maladies des plantes agricoles* (2 vols., Paris, 1895-97); publications of the United States Department of Agriculture, Division of Vegetable Pathology; also many of the reports and bulletins of agricultural experiment stations. For articles particularly relating to bacterial diseases, consult: E. F. Smith, in *American Naturalist* (Philadelphia, 1898-99); *Centralblatt für Bakteriologie und Parasitenkunde, Zweite Abtheilung* (Jena, 1898, et seq.). See Fungicide; Fungi, Economic.

DISEASES OF WHEAT. See Wheat, Diseases of.

DISENTIS, dĕ'sen-tēs. A village in Switzerland, Canton Grisons, situated on the Hither Rhine, 31½ miles southwest of Reichenau, and 3600 feet above sea-level (Map: Switzerland, C 2). It is the site of a large Benedictine monastery, founded in 614 by the Scottish monk Sigisbert. Population, in 1900, 1400.

DISFRANCHISEMENT. See Suffrage.

DISHONOR (ML. *dishonor*, from Lat. *dis-*, apart + *honor*, honor) of Negotiable Paper. The refusal or failure of the drawee of a bill to accept, or of the acceptor of a bill or the maker of a promissory note to pay, it at the proper time. If the drawee of a bill of exchange refuses to accept it when duly presented, the holder should give notice at once to the drawer and indorsers, or he will relieve them from liability on the paper, as a rule. Ordinarily, the drawer of a bill of exchange or a check has funds in the drawee's hands, upon which the bill or check is drawn, and if the drawee refuses to honor the bill or check, the drawer ought to have notice, so that he may withdraw his funds. If a banker dishonors a customer's check by refusing to pay it when the customer's account is good for it, he makes himself liable in damages to the customer, for such an act tends to harm the latter's credit. See Negotiable Paper, and consult the authorities there referred to; see also Bill of Exchange; Check; Promissory Note; Protest.

DISINFECTANTS (from *dis-*, without + Engl. *infect*, from OF., Fr. *infecter*, from Lat. *inficere*, to infect, from *in*, in + *facere*, to make). A class of substances which have the power of destroying the causes of infectious and contagious diseases. In a large proportion of these diseases the causes have been found to be microorganisms of a vegetable nature, called bacteria (q.v.). In the rest of these diseases, such microorganisms are supposed to exist, but have not yet been identified. Disinfectants are used to destroy these germs or to stop infection. The term deodorants is applied to substances that dissipate or destroy foul smells, but do not necessarily destroy germs; and the term antiseptics is applied to substances that prevent the growth especially of those bacteria which cause fermentation or putrefaction of dead tissue, or suppuration in the living body.

All clothing and bedding, curtains, carpets, etc., which ought to be disinfected should be kept moist until completely sterilized, for the bacteria and their spores are easily scattered in the dust arising from handling dry articles. The mucus coughed up by tubercular patients readily pulverizes and mixes with the dust when dry, thus endangering any one who may inhale the dust-laden air of an infected room. All dust which has settled in cracks, on woodwork or furniture of an infected room, should be removed by wiping it up with cloths wet with a solution of bichloride of mercury and water, 1 to 1000; or a 3 per cent. solution of carbolic acid in water; and the cloths should be burned afterwards. The same solution may be used in washing all walls and woodwork. Boards of health advise that apartments, after being thus treated, should be fumigated with sulphurous acid, that all cracks may be thoroughly permeated by a disinfectant. For each 1000 cubic feet of space, 4 pounds of sulphur is placed in an iron pan, which is placed upon a brick, which, in turn, stands in a tub of water. Vessels of boiling water are placed about the room. The sulphur is then lighted and the room closed air-tight. This method is useful in cases of smallpox, scarlet fever, and measles, but it does not kill the germs of diphtheria, anthrax, or tuberculosis. Formaldehyde gas has been employed increasingly as a disinfectant since 1893, as generated by special apparatus from formalin pastilles. Two grams of formalin for every 35 cubic feet of room space has destroyed anthrax, tubercle, diphtheria and typhoid bacilli, streptococcus, and other bacteria in a few hours. Formaldehyde does not injure clothing, fur, paper, leather, photographs, or rubber or metal goods. Dr. W. H. Park, of New York City, indorses the favorable reports on disinfection of dwellings, carpets, bedding, clothing, and upholstery with formaldehyde, and advocates this agent for disinfection of ambulances and other conveyances which can be tightly closed, the gas to be used in the proportion of 10 per cent. by volume, the time of the exposure to be not less than one hour.

Surgeons' instruments are disinfected (or, rather, sterilized) by boiling them in water containing 2 per cent. of bicarbonate of soda, or by exposing them to formaldehyde gas. The latter does not dull keen edges. Surgeons' hands and arms are sterilized by washing with soap and nail-brush, and then with a solution of permanganate of potash or of bichloride of mercury. The fæces of typhoid and cholera patients, and the sputa of patients suffering with tuberculosis, influenza, pneumonia, etc., should be disinfected with a 5 per cent. solution of fresh chloride of lime or a 5 per cent. solution of crude carbolic acid. Either of these disinfectants is useful in disinfecting privy vaults or accumulations of sewage. Peroxide of hydrogen is used in disinfecting suppurating wounds in some cases. Chloride of zinc and chlorine gas, as well as certain patented derivations of the refuse resulting after distilling kerosene from crude petroleum, are used in special cases for disinfection.

Heat and Cold. It must be remembered that the best disinfectant of all is heat. Articles of clothing that can be washed are easily disinfected by the use of boiling water. Other articles may be subjected to baking, or to sterilizing by the use of steam under pressure. Ovens called sterilizers are arranged in hospitals, into which steam at a temperature of about 225° F. is admitted under pressure for the treatment of clothing and bed-coverings. Similar cylinders are constructed for the use of health departments in large cities. Cold kills the bacteria of yellow fever, but not those of anthrax, smallpox, or typhoid fever. Consult Rosenan, *Disinfection and Disinfectants* (Philadelphia, 1902). See Bacteria; Contagion; Infection; Disease, Germ Theory of.

DISK (Lat. *discus*, Gk. *δισκος*, *diskos*, disk). A word of various application among plants. Among Compositæ (sunflowers, asters, etc.) it refers to the central part of the head in which the showy corollas do not occur as at the margin. In other groups it refers to a ring-like structure developed within the flower, from which certain of the floral parts often arise; or to a disk-like structure upon the top of the ovary in certain epigynous flowers. See Flower.

DISLÈRE, dē'slâr', Paul (1840—). A French engineer and administrator, born at Douai. He studied at the Ecole Polytechnique, and in 1861 entered the naval engineers. In 1888 he became an engineer of the first class. From 1868 to 1871 he was in charge of the arsenal at Saigon, French Indo-China; in 1881 was appointed a Councilor of State; and in 1882 received the post of colonial director in the Ministry of Marine. He was transferred in 1891 to the directorship of foreign commerce. His *Traité de législation coloniale* (1886) is regarded as authoritative. His works further include: *La guerre d'escadre et la guerre des côtes* (1876); *Etudes de statistique; Les budgets militaires de la France et de l'Angleterre* (1878); and *Le service militaire aux colonies* (1889).

DISLOCATION (Fr. *dislocation*, from ML. *disclocare*, to dislocate, from Lat. *dis-*, apart + *locare*, to place, from *locus*, place). A displacement of one bone from another with which it forms a joint ('put out of joint' being the popular expression). Dislocations are generally the result of accident, but may also be the result of disease, or may be congenital. The displacement may be partial or complete, and surgeons classify their cases into simple dislocations when the skin remains unbroken, and compound when there is a wound by which the external air may communicate with the joint. Occasionally, in addition to the dislocation, there are fractures of the bones, or lacerations of important blood-vessels in the neighborhood; the dislocation is then said to be 'complicated.' Dislocation is a rare accident in infancy and in old age; because in the former the joint-ends of the bones are very flexible and yield to violence, while the aged skeleton is so rigid that the brittle bones fracture under force that would drive younger and firmer ones out of their sockets. Dislocations are most frequent between the ages of thirty and sixty. Persons with weak muscles, and lax, long ligaments, or those in whom the latter have been softened by inflammation of the joint, are predisposed to dislocation. The joints most frequently displaced are the shoulder and the elbow.

General Symptoms. After a blow, fall, or violent muscular exertion, a limb is found to be immovable at the injured joint; there is great pain, and the shape of the part is changed; but soon swelling ensues, and every distinctive mark about it is obscured. If left alone, or merely treated as an inflamed joint, the swelling gradually subsides, but the immobility continues, the limb is crippled for months or years, when at last Nature may form a new socket for the end of the bone, and some amount of useful motion is restored. The proper shape of the part is never restored, but remains an eyesore to the patient and a disgrace to the surgeon.

Treatment. The general treatment of dislocations consists in reduction or replacement of the bone into its original position. Its return is opposed by the muscles attached to it, which are stimulated to contraction by the pain of the operation, the latter requiring, of course, the application of considerable force. Reduction is accomplished by two methods — manipulation and traction. In using the former the surgeon endeavors first to relax those muscles which by their contraction prevent the return of the head of the bone into its proper position, and then by certain movements to cause the bone to retrace the path by which it escaped from the socket. When manipulation is unsuccessful, the attempt is made to overcome the resisting power of the muscles by traction. When this is fully done the bone usually slips easily into its place, with perhaps some guidance from the hand of the surgeon. Too great violence in traction, however, must never be used, as injury to surrounding tissues, or fracture, may result. In cases which do not readily reduce, anæsthesia must be resorted to in order to produce complete muscular relaxation.

The subsequent treatment consists in rest, with splints or bandages to prevent a recurrence of the dislocation while the rent in the joint-capsule is healing. Four to six weeks are usually necessary for the accomplishment of this process. The treatment of congenital and pathological dislocation is palliative, and requires the use of some special apparatus, although at times operation may give a new and serviceable joint.

DISLOCATION (in Geology). See Fault.

DISMAL SWAMP. A swamp which was in 1906 about 30 miles long and 10 miles wide, lying chiefly in Virginia, and partly in North Carolina (Map: Virginia, H 5). In its centre is Lake Drummond, about 6 square miles in area. Elsewhere the surface is covered with tangled weeds and heavy timber, with a thick undergrowth. A canal crosses the swamp, opening navigation between Elizabeth City, N. C., and Norfolk, Va., thus permitting vessels to pass between Albemarle Sound and Chesapeake Bay. Due to the canal's drainage, much of the swamp's area has been reclaimed.

DISMANTLED (from *dis-*, without + *mantle*). The state of a ship when unrigged, and after her guns, stores, etc., have been taken out. When men-of-war were built of wood they were, if not recommissioned, after completing a cruise, dismantled; in that condition, with hatches and other openings closed, they were secured alongside a navy-yard wharf, and this was called being laid up *in ordinary*. Modern ships are not dismantled, except for repairs. They deteriorate very much faster than wooden ships, and it is vastly more expensive to dismantle and reëquip them.

DIS'MAS, Saint. The name which Catholic tradition has attached to the one of the two malefactors crucified on either hand of Jesus who repented. He is represented with a cross beside him. The impenitent malefactor is called Gesmas. Both names are highly improbable.

DISON, dė'zôn'. A town of Belgium, in the Province of Liège, situated about two miles northwest of Verviers, on a railway line (Map: Belgium, D 4). It has extensive woolen and cotton mills, and had a population in 1900 of 12,546.

DISOWNED, The. A novel by Bulwer-Lytton (1829).

DISPART' (from Lat. *dispartire, dispertire*, to divide, from *dis-*, apart + *partire*, to divide, from *pars*, part). The difference between the semi-diameters of the parts of the gun on which the sights are placed (if on the gun itself). The term is practically obsolete, as sights are now placed on the mount and not on the gun; but it was formerly of great importance.

DISPEN'SARY (Fr. *dispensaire*, from ML. *dispensarius*, from *dispensa*, larder, from Lat. *dispensare*, to disburse, from *dis-*, apart + *pensare*, frequentative of *pendere*, to weigh). An institution in which medical or surgical treatment is given free of charge to patients who are able to walk in and then return home, no beds being provided as in a hospital. In 1687, at a meeting of physicians in London, England, it was resolved to supply the poor with medicines at certain fixed prices. Previous to this, aid and medical treatment were given to the poor at the houses of wealthy people or at monasteries. In 1696 the president, censors, and fifty members of the Medical College of London agreed to maintain a dispensary that should give medical aid to all who asked it, and a building was erected for the purpose, with rooms for seeing patients and dispensing medicines. Physicians were also appointed, who visited the sick poor in their homes. This building, the Royal General Dispensary, Bartholomew Close, London, was opened in 1770. The oldest dispensary in the United States, the New York Dispensary, was founded in 1790. In all cities and large towns in this country dispensaries exist, supported by private charitable organizations, or maintained as 'outdoor poor' departments of county, city, or private hospitals. In some cases medicines are furnished gratuitously; but in most dispensaries in cities a charge of ten cents is made for each medicine prescribed.

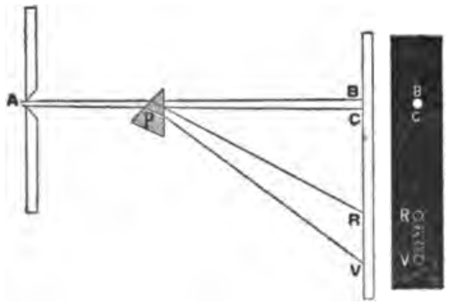
Dispensary Abuse. In all the large cities a great number of well-to-do people seek free medical aid. The blame for this condition appears to lie at the doors of the trustees and superintendents of the clinics and dispensaries, and sometimes at the doors of the physicians who practice in them. The college clinic is established for the purpose of securing material with which to illustrate the didactic lectures delivered by the professors, and with which to teach medical students the appearances and conditions of disease. To give free medical aid to the poor is a secondary consideration. The applicant for free treatment at a college clinic or at a dispensary where the attending physician is allowed to teach private paying pupils with the illustrative aid of the patients, is quite as often admitted in silence as he is questioned about his ability to pay a fair fee to a physician practicing near his home. If the question is asked, the patient is not always truthful, and it is a matter of common occurrence for patients to wear old clothing and give fictitious names and false addresses, in order to avoid paying a physician the fees they are quite able to afford.

In accordance with a law passed April 18, 1899, a new régime was initiated in New York City on October 1 of that year. Since that date, each dispensary must be licensed by the State Board of Charities, and each applicant for a license must take oath that the dispensary is for the public benefit; no school of medicine is obligatory, but the board is empowered to examine every dispensary and revoke licenses of those not conforming to the law. A dispensary is defined to be any person, corporation, institution, association, or agent whose purpose it is, either independently or in connection with any other, to furnish at any place or places, to persons nonresident therein, either gratuitously or for a compensation determined without reference to the cost or value of the thing furnished, medical or surgical treatment, medicine or apparatus; provided that the moneys used by and for the purposes of the said dispensary shall be derived wholly or in part from trust funds, public moneys, or sources other than the individuals constituting said dispensary. Applicants for aid must sign a declaration of financial inability. Violation of the law is punishable by fine. The college clinics, however, seem to escape the control intended by the framers of this statute, because their purpose is to teach medicine to students.

DISPENSATION (Lat. *dispensatio*, from *dispensare*, to disburse). A term in ecclesiastical law to denote a relaxing of the law in some particular case; more specifically a license granted by the Pope or some bishop relieving or exempting an individual in certain circumstances from the action of some law or regulation of the Church. In the Roman Catholic Church, since at least Innocent III., the principle has been established that only the Pope can dispense from the operation of a universal law; but in certain cases he may depute this power to bishops and others. The dispensations known to the Roman canon law are divided into Papal and Episcopal, into dispensations of right and of favor, and (according to the public or secret character of the impediment to be removed) *pro foro externo*, or *interno*. In cases of dispensation *pro foro externo* the authorization is through the administration bureau known as the Apostolic Datoria; in cases *pro foro interno*, through the Pœnitentiaria. The authorization of the bishops to grant dispensations may be normal and renewed every fifth year (*facultates quinquennales*), or given as a mark of personal distinction (*facultates extraordinariæ*). Henry VIII. assumed the ecclesiastical right of dispensation within the realm of England in 1534, and conferred it on the Archbishop of Canterbury in so far as it was not contrary to the law of God. The granting of special licenses for the performance of the marriage ceremony, without publication of banns (q.v.), is the only form in which this power is now exercised by the Archbishop. The only form of dispensation now exercised by the bishops of the Church of England are granted to a clergyman to enable him to hold more benefices than one, or to absent himself from his parish. In the Protestant churches on the Continent of Europe the right of dispensation from the operation of ecclesiastical law has in theory devolved upon the princes, who, however, generally exercise it through the consistories. See DISCIPLINE, ECCLESIASTICAL; MARRIAGE.

DISPERSAL (from *disperse*, from Fr. *disperser*, to scatter, from Lat. *dispergere*, to disperse, from *dis-*, apart + *spargere*, to scatter). In plants, the scattering of seeds, spores (including pollen-grains), and even vegetative members. Hooked appendages, etc., are spoken of as dispersal adaptations. See SEEDS; POLLINATION; SPORES.

DISPERSION (Lat. *dispersio*, from *dispergere*, to disperse). It was shown by Sir Isaac Newton that if a beam of sunlight entered a darkened room through a small round opening, A, and fell upon a prism of glass, P, the light on leaving the prism consisted of colored beams, each beam having a different direction, but merging into its neighbors. Instead of the beam of light falling on the screen at BC and making a bright round white spot, the rays after traversing the prism are divergent and produce the prismatic band seen at RV, the violet rays being bent or refracted the most. The colors thus observed form what is called a *spectrum*. (A better arrangement is to have as the source of light a slit parallel to the edge of the prism, a plan also tried by Newton.) White light is thus dispersed into colors. The angle between the beams of any two colors is called the 'dispersion' of those colors for the given conditions of material and shape of prism and of angle of incidence. Dispersion is due to the fact that ether-waves of different wave-numbers—and hence characterized by different colors if they are visible—travel in a material medium, e.g. glass, with different velocities, and therefore have different degrees of refraction. The 'dispersion-curve' of a given substance is a curve drawn on a diagram having wave-length and index or refraction as abscissæ, showing how these two quantities are connected for the substance. Dispersion may also be caused by various interference and diffraction phenomena. Further, since dispersion is a characteristic of wave-motion, the assumption being that some waves travel faster than others in a given medium, it may be observed with all kinds of waves in suitable media. See LIGHT.



DISPERSION—NEWTON'S EXPERIMENT.

DISPLACEMENT (from *displace*, from *dis-*, without + *place*, Fr. *place*, from Lat. *platea*, Gk. πλατεῖα, *plateia*, street). The weight of an object determined by the amount of water it displaces, i.e. the weight of the water displaced. Formerly both men-of-war and merchant vessels were classed according to their tonnage (q.v.) measurement, and the latter still are; but the former are now classed by displacement as well as design. The displacement selected as a standard for each particular vessel is one in which the vessel is said to be at *mean load draught*. In theory it means that the average amounts of coal and other stores are on board; it is a purely arbitrary condition, however. The only condition in which vessels are justly comparable is with all coal and stores on board. In the United States and Great Britain the displacement of a ship is measured in tons of 2240 pounds; in countries using the metric system, it is measured in tons of 1000 kilograms, or 2204.6 pounds.

DISPLAYED (from *display*, from OF. *despleier*, *desploier*, Fr. *déployer*, It. *dispiegare*, *spiegare*, from ML. *displicare*, to unfold, display, from Lat. *dis-*, apart + *plicare*, to fold). A term in heraldry denoting 'expanded,' applied, for example, to an eagle with wings outspread.

DISPOSITION (Lat. *dispositio*, from *disponere*, to dispose, from *dis-*, apart + *ponere*, to put). The hypothesis of mental dispositions has been used in psychology to bring mental facts into an interconnected and coherent system. It is obvious that the conditions of many mental processes are not themselves directly available to introspection. When, e.g. a name is remembered, it is not always possible to point to the immediate conscious antecedents of the memory. Various hypotheses have been put forward to supply the missing links in the sequence of conscious processes. One hypothesis says that the mind has a 'faculty' of remembering (see FACULTY); another, that the absent terms are to be explained as physiological factors, which are not themselves accompanied by consciousness, but which introduce conscious processes; a third hypothesis refers the matter to the 'subconscious' (q.v.), i.e. to a lower stratum of consciousness, which escapes introspection; and, finally, coherence is brought into mental facts by an hypothesis which posits 'mental' or 'psychical dispositions.' Bain has spoken of 'the permanent products stored up in the mental organization' as 'stores in reserve,' the fruits of experience which may be conceived as lying outside consciousness and yet as affecting mental processes. Such a conception is based upon the fact that past experiences seem continually to color our present thoughts, emotions, perceptions, and actions. I hear a familiar voice, and immediately the face of a friend—as I last saw him, perhaps—comes before my mind. Evidently, if I had had no previous knowledge of the individual, the sound would not have 'aroused' the visual image of his face. One may say, in this and similar cases, that the previous experience left a 'persistent trace' which serves to revive the image.

The difficulty of the hypothesis lies in its inability to give any descriptive account of the conditions of consciousness which it supposes to exist. If one means by 'psychical dispositions' a host of ready-made sensations, ideas, emotions, etc., which are not in consciousness, but which nevertheless exist, one is surely juggling with terms; for consciousness is involved in the very notion of these processes. But if the disposition is neither mental nor material, it can only be an unknown condition which we may call x. For this is sometimes substituted the 'physiological disposition,' which may be considered as a tendency to functionate, dependent upon the molecular condition in which a previous function has left the brain. (See MEMORY.) A physical condition for mental processes is more tangible than a psychical disposition, since it may be deduced from the known laws of neural operation. (See BODY AND MIND.) A common instance of 'physiological' or 'functional disposition' is furnished, e.g., by the law of neural habit known as the 'law of co-excitation' of different parts of the brain. (See ASSOCIATION OF IDEAS.) The theory is sometimes rejected on the ground that very little is known in detail concerning the physiological processes underlying consciousness. But we are at least abandoning a theory which works fairly well for a bare hypothesis, when we desert 'physiological' for 'psychical disposition.' Consult: Stout, *Analytical Psychology* (London, 1896); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1902-3); Bain, *The Senses and the Intellect* (London, 1868).

DISPOSITION. In music, the estimate of cost before building an organ, also a concise description of the working parts of an organ, as stops, keys, pedals, etc.

DISPUTATION (Lat. *disputatio*, from *disputare*, to dispute, from *dis-*, apart + *putare*, to think). An exercise of logical and dialectic skill in which one party advances an argument and the other seeks to refute it. Challenges to such exercises were often issued—e.g. at Paris in 1577 by the 'Admirable Crichton.' Memorable religious disputations were those between Knox and Kennedy (1562), and between Laud and Fisher the Jesuit (1623). The practice survives as an academic form in some of the German universities, where the candidate for the doctorate is obliged publicly to defend the thesis contained in his printed dissertation. Formerly this disputation was held in Latin, but this is less often the case in late years.

DISRAELI, dĭz-rā'lĭ *or* dĭz-rē'lĭ, BENJAMIN, Earl of Beaconsfield (1804-81). An English author and statesman. He was born in London, December 21, 1804, the son of Isaac D'Israeli, author of *Curiosities of Literature*, who belonged to a Jewish family. His education was carefully superintended by his father. In 1821 he was articled to a solicitor with a view to a Government office, but, finding the study of the law uncongenial, he withdrew his name from Lincoln's Inn in 1831. He had meanwhile become famous as an author, having published his book *Vivian Grey* in 1826. He continued his literary career, and spent three years (1828-31) traveling in Spain, Italy, and the Levant. He was, however, more ambitious for political than for literary celebrity, and after two unsuccessful attempts to enter Parliament as a Radical, he succeeded in entering as a Tory from Maidstone in 1837. Before this time, his political pamphlets, especially his *Vindication of the British Constitution*, which Peel commended, had attracted wide attention. In the House his maiden speech was so much in the grand style, and delivered with so many extravagant gestures, that it excited ridicule. Much disconcerted, Disraeli stopped abruptly, making, however, the prophetic remark, "I shall sit down now, but the time is coming when you will hear me." From this time on he studied carefully the style of successful Parliamentary orators and propagated his political tenets in his novels, *Coningsby* (1844); *Sybil* (1845); and *Tancred* (1847). Looking toward the Stuart monarchy for inspiration, he held that the Government from 1688 to 1832 had been a Whig oligarchy, but that now the Crown, released by the Reform Bill, might regain some of its powers, thereby solving many modern political and social problems. This idea, plus his Semitic ideals, was a tenet of the Young English Party, of which he became the leader. In 1843 the landed aristocracy and country gentry found in him a spokesman for the dissatisfaction with which they regarded the threatened relaxation of the protective system. In 1846 he made a most bitter attack on Peel in the debate on the repeal of the Corn Laws, and on the death of Bentinck, in 1848, he became the acknowledged leader of the protectionist party in the Commons. He bore generous testimony to the worth of his predecessor in his *Lord George Bentinck: A Biography* (1852). The same year, the Earl of Derby offered him the post of Chancellor of the Exchequer, a position which he held with honor and credit. Seeing that the nation now desired free trade, he coolly discarded protection. His second budget was, however, rejected by the Commons and the Cabinet resigned in December, 1852. Disraeli did not resume his position until the second Derby Ministry (1858). One of his greatest disappointments was Derby's refusal to form a Ministry with the aid of the Peelites in 1857, as Disraeli thought the country ready for his favorite reforms. There was but a scanty majority for the Ministry of 1858, and in 1859 Disraeli's reform measure, the weak 'Franchise' Bill, was rejected.

During the seven years of Liberal rule that followed, Disraeli had to contend not only against the popularity of Lord Palmerston, but against suspicion and dissatisfaction in his own party. His talents, spirit, and persistency were so great during this trying time that he won admiration from all, even from his opponents.

When Derby returned to power in 1866, Disraeli again became Chancellor of the Exchequer, and in 1868 he succeeded Derby as Premier. In the ensuing election of that year, however, he was defeated by an overwhelming majority.

In 1874 he returned to power with a safe Conservative majority for the first time in his career. Although his Ministry assured many useful reforms, like the different factory acts, the poor-law amendment, and the artisans' dwelling acts, it became famous chiefly through its foreign policy, conducted by the strong hand of Disraeli himself. His policy was aggressive and essentially imperial. He acquired control of the Suez Canal, interfered in Afghanistan to thwart Russia, and in 1877 proclaimed the Queen of England Empress of India. He called a halt to the Russian advance upon Constantinople in 1878, sending a British fleet to the Dardanelles and a division of the India Army to Malta, and proudly declared on his return after making the Treaty of Berlin that he brought peace with honor. In Africa the Transvaal was annexed and the power of the Zulus broken. In 1880, however, his Ministry was overthrown. His health had ere this required him to withdraw from the leadership of the House of Commons, and in 1878 he had entered the House of Lords as the Earl of Beaconsfield. On April 19, 1881, he died in London.

From whatever standpoint we view Beaconsfield's career, we cannot but be struck with wonder. That a Jewish novelist should become the acknowledged champion of the British aristocracy seems past all belief. His statesmanship was of a high order. The Empire, the Constitution—these were the watchwords of his policy. His foreign policy was the continuation and development of that of Chatham, Pitt, Canning, and Palmerston, essentially aggressive and imperialist. His domestic policy was far ahead of his party's, yet he managed, unlike Peel and Gladstone, who disrupted the party organization, to lead it to concessions of which it had not thought —to 'educate it,' as he himself said. He found the Conservatives a party of obstruction, reactionary, and out of touch with the times; he left them in line with modern development, and in a position to inaugurate reforms. A Tory in theory, he was liberal in practice. What else could be said of a man who at the outset of his career advocated the establishment of the Roman Church in Ireland, the enfranchisement of the British peasantry, the reform of the provincial administration?

Disraeli's triumphs in the House of Commons were largely due to his great skill as an orator and a debater. His skill lay in a clear and dignified presentation of facts, and, above all, in his marvelous use of wit and satire. This remark holds also for his literary works, the chief flavor of which lies in the witty introduction of contemporary celebrities. They often contain beautiful descriptions, but excel in the portrayal of what we call society. He writes best in the language of the salons and club-rooms. Among his best works are *Henrietta Temple* (1837); *Coningsby* (1844), a vindication of the Jewish race; *Sybil* (1845); *Tancred* (1847), abounding in Oriental descriptions; and *Lothair* (1870), a story of a weak-minded nobleman, with incidental descriptions of the life of very exalted personages in British society (1880). *Endymion* is well known and characteristic, but far inferior to *Coningsby* and *Sibyl*.

Personally he was affable, constant in friendship, and prompt to discover and aid merit. In his youth he was eccentric in dress and manners, but this he outgrew; he was always theatrical and fond of attracting attention. His private life was above reproach. He married Mrs. Wyndham Lewis, a rich widow much older than himself, in 1839. He found in her 'the perfect wife,' and when she died in 1868 he felt 'that he had no longer a home.'

Consult: *Selected Speeches of the Earl of Beaconsfield*, ed. by T. E. Kebbel (London, 1881); *Lord Beaconsfield's Correspondence with His Sister*, ed. by R. Disraeli (London, 1886); J. C. Thompson, *Public Opinion and Lord Beaconsfield* (London, 1886); T. Martin, *Memorials of Lord Beaconsfield* (London, 1881). Consult also the Lives by J. S. Mills (London, 1863); T. P. O'Connor (London, 1878), hostile; G. Brandes (Copenhagen, 1878; English translations, New York, 1880), favorable; C. Clarigny (Paris, 1880); A. C. Ewald (London, 1883); F. Hitchman (London, 1872); T. E. Kebbel (London, 1888), excellent; Kebbel's article, "Disraeli," in *Dictionary of National Biography* (1888); J. A. Froude (London, 1890), in S. J. Reid's *Prime Ministers of Queen Victoria*; T. Martin, *The Life of H. R. H. the Prince Consort* (London, 1880); Meynill, *Benjamin Disraeli* (London, 1903); Sichel, *Disraeli* (London, 1904); id., *Life of Lord Beaconsfield* (London, 1904). Consult also Leslie Stephen's article, "Mr. Disraeli's Novels," in the *Fortnightly Review*, vol. xxii.

D'ISRAELI, Isaac (1766-1848). An English author. He was a descendant of a Hebrew family which had established itself in Spain and Italy. His father, Benjamin D'Israeli, went to England in 1748, and, entering into business in London, amassed a fortune. Isaac, who was born at Enfield, was educated at a school in his native town, and in Amsterdam. He began his career as a poet and novelist; but after the publication of the first volume of his *Curiosities of Literature* (1791), he discovered that his *forte* lay not in creative literature, but in the illustration of historical and literary character, and he devoted himself to that. His works, though inaccurate, are interesting. By his contemporaries he was liked, both as an author and as a man. Byron wrote of him as "that most entertaining and researching writer." D'Israeli's principal works are the *Curiosities of Literature* (1791-1834); *A Dissertation on Anecdotes* (1793); *Essay on the Manners and Genius of the Literary Character* (1795); *Calamities of Authors* (2 vols., 1812-13); *Quarrels of Authors* (3 vols., 1813-14); *Inquiry into the Literary and Political Character of King James I.* (1816); *Commentaries on the Life and Reign of Charles I.* (1828-30); *Amenities of Literature* (1840). He was the father of Benjamin Disraeli. His *Works*, edited by his son, were published in seven volumes (London, 1858-59).

DISSECTION WOUNDS (from Lat. *dissecare*, to cut up, from *dis-*, apart + *secare*, to cut). The danger from wounds accidentally contracted during dissection is relatively small, it being an established rule that every puncture should be carefully sucked as soon as it is observed, and the part then frequently touched with a solid stick of nitrate of silver or with nitric acid. Abrasions and small wounds on the hands should be protected with collodion or with rubber gloves before beginning to dissect. If, however, the poison has been absorbed and infection has occurred, the patient begins to have a feeling of general illness in less than twenty-four hours. He is low-spirited, faint, and chilly, and often complains of nausea. Then come rigors, intense headache, rapid and sharp (but weak) pulse, a coated tongue, great restlessness, and sometimes vomiting. The first local symptom is intense pain, with swelling and heat at the point of infection. Later the arm may swell, and there may follow pain in the shoulder of the wounded side, followed by fullness of the neck or armpit, extending in the form of a doughy swelling down the side of the trunk and assuming a pinkish tint. If incision at the point of infection and evacuation of pus does not give relief, general septicæmia may follow. The general symptoms increase in severity; breathing becomes difficult; the pulse becomes very rapid and weak; the tongue becomes dry, brown, and often tremulous when protruded; and the skin assumes a more or less pronounced yellow tinge. The case may terminate fatally at or before this stage; or abscesses may continue to form, from which the patient may more slowly sink; or, if he survive, the arm may remain stiff and useless, or amputation may be necessary. See PYÆMIA; SEPTICÆMIA.

DISSEISIN (OF. *disseisin*, from *disseisir*, *dissaisir*, Fr. *dessaisir*, to disseise, from *des-*, *dis-*, apart + *seisir*, *saiser*, It. *sagire*, to seize, from ML. *sacire*, to take possession of, from OHG. *sazzan*, Ger. *setzen*, to set). At common law, the process of acquiring title to land by a wrongful possession thereof, accompanied by a claim to the freehold. It involved the double notion of the ouster of the rightful owner from his seisin and the definite acquisition of seisin by the newcomer. Its extraordinary efficacy in making a wrongful act of dispossession the basis of a valid (though defeasible) title is due to the transcendent importance which at the feudal law attached to the bare fact of possession of lands. The person seised of lands—that is, possessed of them and claiming them as his own—was not only 'presumed' to be the rightful owner, as we should express it to-day, but was, to all intents and purposes, in his public as well as his private relations, regarded as the owner. As to the person whom he has ousted (the *disseisee*), the possessor may have been only a *disseisor;* but in the eye of the law he was invested with the title, which would pass by descent to his heir or which he could alienate at his pleasure.

Of course, this title was a defeasible one, which could by entry or by appropriate legal proceedings, taken within a limited time, be destroyed, notwithstanding its descent or alienation; but pending such action it was the only existing right in the land which was recognized by the law as an estate or legal interest. The disseisee, whom we call the rightful *owner*, was in effect only a rightful *claimant*, and what he had was not an estate or interest in the land, but a mere right of entry, which might or might not some time ripen into a legal estate, and certain cumbersome and expensive rights of action, which might or might not avail him. Though these rights were capable of transmission by descent, they could not be alienated or made available to another, and if not exercised within the longer or shorter term to which they were limited by law they were barred altogether. In the earliest period of English law, only a few days were allowed for making a reëntry upon lands—only so long as might be necessary to enable the disseisee to learn of the disseisin and make the necessary journey to the spot. Later the period of limitation was fixed by statute at sixty years and upward, and it is now, according to the jurisdiction, fixed at periods of ten to twenty years, but the practice and effect of a disseisin, and the respective rights of the parties in the land, continue to be substantially the same as at common law. See ADVERSE POSSESSION; DESCENT CAST; LIMITATION; PRESCRIPTION; and SEISIN. Consult the authorities referred to under REAL PROPERTY.

DISSEMINATION (Lat. *disseminatio*, from *disseminare*, to scatter seed, from *dis-*, away + *seminare*, to sow, from *semen*, seed). The scattering of seeds. Often used in the sense of dispersal (q.v.).

DISSEN, dĭs′sen, GEORG LUDOLPH (1784-1837). A German classical scholar, born near Göttingen. Not long after receiving his degree at the university of his native city, where he had been a pupil of the philologist Heyne, he was made professor extraordinarius (1813), and in 1817 full professor of the same institution. In early life he gave especial attention to the philosophy of the ancients, but afterwards devoted himself almost exclusively to æsthetic interpretation of the classics. In these he attached special importance to the development of rigid stylistic laws, which he maintained governed all oratorical and political compositions among the ancients. In addition to two admirable treatises, *De Temporibus et Modis Verbi Græci* (1809) and *De Philosophia in Xenophontis de Socrate Commentariis Tradita* (1812), he published editions of *Pindar* (1830), *Tibullus* (1835), and the *De Corona* of Demosthenes (1839). His minor writings, *Kleine lateinische und deutsche Schriften*, with biographical reminiscences by F. Thiersch, F. G. Welcker, and K. O. Müller, appeared after his death (1839). Consult Bursian, *Geschichte der klassischen Philologie in Deutschland* (Munich, 1883).

DISSENTERS (from Lat. *dissentire*, to disagree, from *dis-*, apart + *sentire*, to think). A name popularly applied to those who refuse to accept the authority or conform to the laws of an established Church, specifically in England, although the word dissidents occurs in the acts of the Warsaw Confederation of 1573, to denote the Polish Protestants of that day. As an English term it became common in the seventeenth century to denote the bodies who separated from the Church of England; though it is not commonly applied to Roman Catholics (for whom the older title was recusants), nor to members of the Episcopal Church in Scotland, though both these bodies dissent from the established churches. For the history of repressive legislation in England, and its gradual mitigation, see TOLERAtion; Nonconformists; also Establishments, Ecclesiastical.

DISSEP'IMENT. A partition in plants such as divides an ovary into compartments, equivalent to a trama in hymenomycetous fungi.

DISSOCIATION (Lat. *dissociatio*, from *dissociare*, to disrupt, from *dis-*, away + *sociare*, to associate, from *socius*, associate). A term applied in chemistry to an important class of decompositions. The distinction between decomposition and what is now usually termed dissociation is discussed in the article on Decomposition. Another distinction requires explanation in the present sketch—viz. that between chemical dissociation and electrolytic dissociation.

Chemical Dissociation. Like ordinary chemical decomposition, chemical dissociation involves the breaking up of a given chemical substance into parts each of which is capable of independent existence. In the case of sal ammoniac (see Decomposition), the products of dissociation are ammonia gas and hydrochloric acid—two well-known chemical compounds. Other typical examples of chemical dissociation are presented by the vapor of phosphorus pentachloride, by the tetroxide of nitrogen, and by ordinary chalk. In the case of phosphorus pentachloride, which is itself colorless, the dissociation is rendered evident by the fact that of the two products—viz. phosphorus trichloride and free chlorine—the latter is green; this dissociation may therefore be readily demonstrated by heating some phosphorus pentachloride in a glass vessel. Even more striking is the dissociation of the tetroxide of nitrogen, N_2O_4, which is, at low temperatures and in a pure state, a yellowish, almost colorless liquid, but whose vapor breaks up, on the application of heat, into a dark, brownish-red oxide of nitrogen, represented by the formula NO_2. Both in the case of phosphorus pentachloride and in the case of nitrogen tetroxide, lowering the temperature causes a recombination of the products of dissociation and a consequent disappearance of the color. The manner in which the dissociation of sal ammoniac may be demonstrated is described in the article on Avogadro's Rule (q.v.). It must be observed here that, according to H. B. Baker (1893), sal ammoniac does not dissociate at all if very carefully dried, nor do perfectly dry ammonia and hydrochloric acid combine to form sal ammoniac. The extent to which a compound may be dissociated is strongly influenced by two physical factors—viz. temperature and pressure. Thus, in the case of nitrogen tetroxide, the application of a very moderate degree of heat would cause only a fraction of the total amount employed to break up. But as the temperature would be allowed to rise, the dissociated fraction would increase, and this would be plainly shown by the color of the gas rapidly becoming more and more intense. On the contrary, increasing pressure would cause the dissociated fraction to diminish, as would be indicated by the gradual disappearance of the color. Careful experiments, carried out at the temperature of about 50° C., have shown that at that temperature nitrogen tetroxide is completely dissociated if the pressure is reduced to nothing; under a pressure of about 498 millimeters of mercury, only a half of the tetroxide is broken up. In the case of a solid substance whose dissociation products include one or more gases, matters are somewhat different. An elevation of temperature causes, just as in the case of gases, an increase of the dissociated fraction; but the pressure of the gaseous product of dissociation *cannot* be increased. The phenomenon is in this respect perfectly analogous to the evaporation of water. It is well known that for every given temperature the vapor-pressure of water is constant; an attempt to increase that pressure would be unsuccessful and would only cause some of the vapor to condense. This is precisely what happens in the classical case of the dissociation of chalk. Under the influence of heat, chalk breaks up into quicklime and carbonic acid. The higher the temperature the less chalk remains undissociated and the greater the amount of the carbonic acid produced. But if at a given temperature we should attempt to increase the pressure by diminishing the volume within which the substances are confined, the result would be that some of the carbonic acid would recombine with the quicklime, and thus the original pressure would soon be reëstablished. This fixed pressure is often referred to as the 'dissociation-tension' of chalk, just as the pressure of water-vapor at some given temperature is spoken of as the vapor-tension of water at that temperature. Again, just as the vapor-tension of water is the same whether the amount of water is large or small, so is the dissociation-tension of a solid substance independent of the amount of the latter experimented upon.

Electrolytic Dissociation. Quite different from the phenomenon of chemical dissociation is electrolytic dissociation; and it must be borne in mind that while the former is a fact, the latter is theoretically inferred to be the cause of the exceptional behavior of many solutions, but cannot be gotten at directly. Nevertheless, the theory of electrolytic dissociation is now almost generally accepted by chemists, and careful investigation brings forward, month after month, new proofs of the extreme probability of its correctness and usefulness. According to this theory, acids, bases, and salts break up, when dissolved in water, into atoms or atomic groups, some of which are charged with positive, others with negative electricity. Thus, hydrochloric acid is supposed to dissociate according to the following equation:

$$\mathrm{HCl} = \overset{+}{\mathrm{H}} + \overline{\mathrm{Cl}};$$

caustic potash dissociates as follows:

$$\mathrm{KOH} = \overset{+}{\mathrm{K}} + \overline{\mathrm{OH}};$$

the salt called potassium chloride, as follows:

$$\mathrm{KCl} = \overset{+}{\mathrm{K}} + \overline{\mathrm{Cl}}.$$

These equations must not, however, be taken to mean that, for example, a solution of potassium chloride contains chlorine gas and the metal potassium in the free state. Indeed, comparing a solution of potassium chloride with one of chlorine gas, it may be seen that while some free chlorine is constantly escaping from the latter, no free chlorine can be detected in the former; a solution of potassium chloride exhibits neither the color, nor the odor, nor the bleaching power of free chlorine. The symbol $\overline{\mathrm{Cl}}$ denotes what is called an electro-negative chlorine 'ion,' and the existence of an 'ion' is not an independent existence, but involves necessarily the existence of another ion, carrying an equal charge of the opposite form of electricity. Free chlorine gas would, however, *form* from the chlorine ions if the latter lost their electric charges; which is precisely what happens when the solution is subjected to a process of electrolysis. When the electrodes of a galvanic battery are immersed in the solution, the negative chlorine ions are attracted toward the positive electrode, by which their electric charge is neutralized. The chlorine ions then become simply chlorine atoms, and these combine in pairs, forming molecules of free chlorine gas. At the same time the positive ions are attracted and transformed into a free chemical substance, at the negative electrode; for neither can electro-positive nor electro-negative ions exist alone. A current of electricity is then said to pass through the solution, and the latter is said to be electrolyzed. Now, if this explanation of the mechanism of electrolysis be correct, it is evident that the electrical conductivity of a solution must be proportional to the number of free ions in it; and hence the numbers of free ions in different solutions may be ascertained by measuring the conductivities of the solutions. It is equally evident that, if the explanation is correct, the total number of *particles* (ions as well as molecules) in a solution, say, of potassium chloride is greater than what it would be if that salt was not dissociated. Comparing a solution of an electrolyte (i.e. an acid, base, or salt) with a solution of an equivalent quantity of any non-electrolyte, the former solution must contain a larger total number of particles than the latter; because in the latter the number of particles is not increased by dissociation.

These considerations have been applied to explain the abnormal behavior of solutions of acids, bases, and salts. When dissolved in water, these substances have been known to affect its physical properties much more than equivalent amounts of substances of any other class. Thus, dissolving a given amount of common salt causes the boiling temperature of water to become much higher than dissolving an equivalent amount of sugar (a non-electrolyte); and the same may be said of the lowering of the freezing-point of water and of certain other changes in its physical properties. In the case of a non-electrolyte, the elevation of the boiling-point, as well as the depression of the freezing-point, is found to be proportional to the amount of substance dissolved, and can therefore be readily calculated. In the case of electrolytes, and only of these, that proportionality is not found to exist; and before the invention by Arrhenius of the theory of electrolytic dissociation, the exact change in physical properties of the solvent produced by these substances could not be calculated. The theory of dissociation attacks this problem in the following manner: It starts with the principle that the changes are proportional to the number of particles of the dissolved substance; combines this principle with the idea that the number of free ions in a solution is shown by the electrical conductivity; calculates the total relative number of particles from the relative number of free ions present; and then calculates the elevation of the boiling-point and the depression of the freezing-point from the total number of particles. The figures thus obtained by theoretical calculation are found to be in remarkably close agreement with the results of actual observation, and this indicates more strongly than any other fact could the great probability of the correctness of the theory of dissociation.

Electrolytic dissociation is usually incomplete. That is to say, of the total number of molecules in solution, only some are usually dissociated into ions, the rest remaining undissociated. The dissociated fraction, representing the 'degree of dissociation,' depends on two factors: the concentration of the solution and the temperature. When the concentration is diminished by adding pure water to the solution, the degree of dissociation becomes greater; by adding a very large amount of water to the solution, the dissociation may in many cases be rendered complete, i.e. no molecules may be left undissociated. As to the influence of temperature, no clear causal relation has as yet been established; empirically it is known that a rise of temperature causes in some cases an increase, in other cases a decrease, of the degree of dissociation. Comparing the two forms of dissociation, chemical and electrolytic, we find that they resemble each other with regard to concentration, but differ with regard to temperature. Increasing the pressure of a gas causes its volume to diminish, and hence its concentration, i.e. the amount of matter in unit volume, to increase. A similar rule holds good in the case of electrolytic dissociation in solution. On the other hand, a rise of temperature invariably causes more molecules to dissociate chemically, but in many cases has the reverse effect on substances dissociated electrolytically. The theory of electrolytic dissociation performs in a remarkable degree the function of a truly scientific theory, viz. that of bringing out a connection between phenomena that are seemingly very different in their nature. Who would imagine, for instance, that the boiling or freezing temperature of a solution of common salt has any connection with its electrical conductivity? Arrhenius's theory establishes an exact mathematical relation. The theory draws for us a picture of things that lie as far beyond the power of our senses as the remotest of the unseen worlds in space; yet the more proofs are adduced of the correctness of the theory, the more probable it becomes that the picture drawn by it is actually true to reality. To the practical scientist, however, this is of secondary importance. Much more important is the fact that the ionic theory furnishes indisputably valuable *working principles*. It can be and has been criticised; and scientific criticism is always useful. Nevertheless, many able chemists are devoting their energy to develop it and apply it to all possible cases. Let the theory be abandoned as inadequate to-morrow; to-day it leads us to the discovery of new relations, and it has correlated (i.e. explained) a variety of facts that were unintelligible yesterday. It has already explained many of the facts of organic and analytical chemistry; it has explained the behavior of the different indicators used in alkalimetry and acidimetry; and it is being more and more extensively applied to problems of physiology and bacteriology. Thus, the researches of Louis Kahlenberg have shown that the poisonous action of acids, bases, and salts depends on the degree of their dissociation in solutions. Similar results were obtained by Paul and Krönig, who investigated the action of acids and bases, and of the salts of mercury, gold, and silver, on the spores of the anthrax bacillus and on the vegetative forms of *Staphylococcus pyogenes aureus.* Grützner and Haffner have shown that the casein precipitated in milk by the addition of acids depends on the degree of dissociation of the latter, and that the presence of salts modified this relation in accordance with the theory of dissociation. The researches of Jacques Loeb have shown the importance of the applications of the electrolytic theory to the physiology of man and of the lower animals. Consult Talbot and Blanchard, *Electrolytic Dissociation Theory* (New York, 1905). See ELECTRO-CHEMISTRY; SOLUTION; ACIDS.

DISSOLVING VIEWS. Pictures on a screen produced by a mechanical device attached to the magic lantern or stereopticon which causes the image furnished by one slide to dissolve, as it were, or blend into that of the following slide. Two lanterns are generally employed to secure this effect, which is obtained by gradually covering one of the projection lenses and allowing the rays from the other to fall on the screen.

DISSONANCE (Lat. *dissonantia,* from *dissonare,* to sound harshly). The simultaneous sounding of two or more tones foreign to a major or minor triad. Dissonance produces a feeling of unrest requiring a resolution into consonance (q.v.). This feeling of unrest is attributed to the complex ratios existing between the number of vibrations of dissonant intervals; whereas the ratios of consonant intervals are always simple. In reality it is impossible to set up any exact limits of dissonance, as what may seem dissonant to one person may seem consonant to another. But it is easy to establish certain landmarks within which each individual will, to a certain extent, determine the bounds of dissonance. Dissonant intervals are the major and minor second and all augmented or diminished intervals. (See INTERVAL.) Chords containing one or more dissonant intervals are dissonant chords and require resolution. The dissonant chords are all augmented and diminished triads, as well as all chords of the seventh and ninth. See ACOUSTICS; CHORD; HARMONY; TRIAD.

DISTAFF (AS. *distæf,* from * *dise,* OE. *dizen,* to dress with flax for spinning, to bedizen, Low Ger. *diesse,* flax on the distaff + *stæf,* staff). The staff on which the flax or wool is fastened, and from which the thread is drawn in spinning. As represented in ancient art, and still used by Greek peasants, it is a straight rod, from either side of which projects near one end a semicircle of cane or withes, forming a bed to which the wool or flax is attached. In both ancient and modern art, the Fates are usually represented with it, engaged in spinning the thread of life. It has ever been considered as the peculiar emblem of feminine as opposed to masculine occupations, and is sometimes used figuratively for a woman.

DISTAFF'S DAY, SAINT. A name given to January 7, because it marks the return of the women to their usual daily occupation after the Christmas festivities terminating on the Twelfth Day, January 6.

DISTANCE (OF., Fr. *distance,* from Lat. *distantia,* from *distare,* to be distant, from *dis-,* apart + *stare,* Gk. *ἱστάναι, histanai,* OChurch Slav. *stati,* Skt. *sthā,* to stand; connected with OHG. *stēn,* Ger. *stehen,* to stand, and ultimately with Goth., AS. *standan,* Engl. *stand*). In navigation (q.v.), the distance between any two places is the length of the rhumb-line (q.v.) between the places. On the ordinary sailing chart (Mercator's projection) the rhumb-line is straight. Also, the angular distance between heavenly bodies measured on the arc of the great circle passing through them.

The limit of view in a picture, or *point of distance,* as it is called in perspective, is that portion of the picture where the visual rays meet; the *middle distance* being the central portion between the extreme distance and the foreground. Distance, in a picture, is obtained by painting the tones that express the relative remoteness of a distant object with the same directness and truth that is employed in portraying those objects that are near at hand, or in the *foreground,* as it is called. When distant objects are thus true in color, the quality of distance will be produced by the diminution in size which obedience to the laws of perspective exacts. See PERSPECTIVE.

DISTANCE, or **DEPTH,** PERCEPTION OF. When we look at objects we think that we *see* how far away they are. Yet their distance is not directly given with the act of vision. It is true that a few writers, e.g. Hering and James, believe that the primitive field of view was not altogether flat, and that distance is 'a genuinely optical feeling'; but the majority agree that it is derivative, built up by the association of tactual ideas with certain 'signs,' visual and strain sensations arising in the use of the eyes. In either case it is admitted that the 'optical signs' themselves, the 'criteria of distance,' as they are called, are essential to the complete development of the idea. We must distinguish between the 'primary,' immediately given, and the 'secondary,' or indirect criteria. The former are (1) dissimilarity of retinal images; (2) convergence strains; (3) accommodation strains; and (4) dispersion circles. The last must be taken together with the third. Alone, it is of minor importance; for accommodation, which clarifies moderately distant objects, will occasion dispersion circles for both nearer and farther objects. The strain set up in the ciliary muscle as it focuses the lens may, however, serve as a definite empirical criterion of distance. The second factor results from the functioning of the eyes in binocular vision. If we are to have a single clear image of near objects, the eyes must converge. The intensity of the strain sensations thus engendered increases in proportion to the proximity of the fixated point. Experimental investigations of the sensitivity to strain sensations, as well as the anatomical arrangement of the twelve eye-muscles, warrant the assumption that such sensations may give accurate indications of the distance of objects, at least up to a few hundred feet. Convergence, together with accommodation, is, according to Wundt and Arrer, the essential basis of the perception of depth. But other authorities, notably Wheatstone, Hering, and Hillebrand, lay stress upon the dissimilarity of retinal images. We have given us, in our two eyes, two pictures of every object seen. The difference between the two pictures increases with the nearness of the object. The testing of the part played by this disparity in the perception of distance led to the invention of the stereoscope, which enables us artificially to reconstruct the actual retinal conditions of binocular vision.

In our daily life, it is perhaps true that the secondary criteria become most important; they are at least most in evidence. These indirect data of distance are seven in number: (1) linear perspective, i.e. the perspective of drawing, the course of the contour lines of objects in the visual field; (2) aërial perspective, i.e. distinctness of outline and color-tone; (3) the number of intervening objects, or the partial covering of the distant by the nearer; (4) movement of objects in the visual field, e.g. swiftly moving objects seen from the window of a moving train are known to be near; (5) movement of our own head or body, with consequent relative displacement of objects differently distant; (6) distribution of light and shade, e.g. the illusion of depth given by appropriately shaded stage-settings; and (7) visual angle, i.e. the apparent size of known objects. The two last are the most influential. Consult: Berkeley, *An Essay Toward a New Theory of Vision* (London, 1709); Wundt, *Human and Animal Psychology*, trans. by Creighton and Titchener (London, 1896); Titchener, *An Outline of Psychology* (New York, 1902); James, *Principles of Psychology* (New York, 1890).

DISTEMPER (OF. *destemprer*, to distemper, ML. *distemperare*, from Lat. *dis-*, apart + *temperare*, to temper, from *tempus*, time). A typhoid inflammation affecting the upper air-passages of young dogs, and resembling in many respects the strangles of young horses, and the scarlatina and other such complaints of children. Like these, it is contagious, runs a definite course, is accompanied by low fever and debility, and is most successfully treated by good nursing and attention to diet and regimen. The eyes are red, weak, and watery; the nose dry and hot; draughts of air or movements of the animal readily excite sneezing or cough; there is dullness, fever, and loss of appetite. The thickened slimy mucus which the inflamed membrane, after some days, secretes, accumulates about the eyes, nostrils, and respiratory passages, and, lodging in the bronchial tubes, prevents the free access of air and the proper purification of the blood. Hence ensue distressed breathing, increasing weakness, and symptoms of nervous disturbance, such as staggering gait, chorea (q.v.), and fits. All dogs are liable to distemper, but the delicate, highly bred, and artificially treated varieties suffer most severely. All irritating and reducing remedies must be carefully avoided, and a good dry bed in a comfortable airy place provided. The stomach, which is generally overloaded, should be relieved of its contents by an emetic, which for an ordinary-sized English terrier may consist of two grains each of tartar emetic and ipecacuanha, with eight or ten grains of common salt, given in a wineglassful of tepid water. If no effect is produced, the dose must be repeated in twenty minutes. Constipation, if present, should be corrected by half an ounce each of castor and olive oil, to which, in large dogs, a few grains of gray powder is a useful addition. The febrile symptoms, if acute, may be alleviated by giving four times daily, in cold water, two drops of tincture of aconite, and five grains each of nitre and extract of belladonna. In cases where the pulse is very weak care should be exercised in the administration of aconite. Piorkowski has recently recommended a serum for use in the treatment of dog distemper, claiming that it is successful in a majority of cases. This has been confirmed in a few cases, while others report that the serum has no effect. The throat may also be rubbed with hartshorn and oil, and the nostrils sponged and steamed occasionally. Give frequently, and in small quantities at a time, milk and bread, or any other such simple and digestible food; and when recovery is tardy, and weakness ensues, endeavor by nursing, and by the use of tonics and stimulants, to support the strength.

The term distemper is sometimes applied to influenza (q.v.) in horses, and epizoötic pleuropneumonia (q.v.) in cattle. For an account of distemper in pigs, see HOG CHOLERA.

DISTEMPER (IN PAINTING). See TEMPERA.

DISTICH, dĭs′tĭk (Lat. *distichon*, Gk. *δίστιχον*, *distichon*, distich, from *δι-*, *di-*, double + *στίχος*, *stichos*, row, from *στείχειν*, *steichein*, to tread). The classical name given to any couplet, but especially to a hexameter and pentameter, making complete sense. It was much used by the Greeks and Romans as a vehicle for the expression of single thoughts and sentiments; and hence became almost exclusively employed for the classical epigram. The great poets of modern Germany, Goethe, Schiller, etc., have also shown a fondness for the distich, and a remarkable skill in the use of it. A collection of moral maxims in Latin, ascribed to a certain Dionysius Cato (q.v.), are called *Disticha*, and were highly popular during the Middle Ages.

DISTILLATION (Lat. *destillatio*, from *destillare*, to distil, from *de*, down + *stillare*, to drop, from *stilla*, drop). A process consisting in the evaporation of liquids by boiling and the subsequent liquefaction of their vapors by cooling. The purpose of distillation is to separate different substances from one another more or less completely. The process has been in use since ancient times, and in the first centuries of our era was employed in much the same manner as at the present time. In the third century A.D. sea-water was by distillation rendered fit for drinking, and it was known that prac-

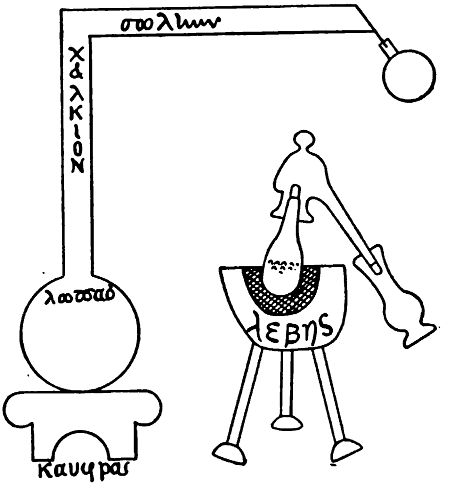


FIG. 1. DISTILLING APPARATUS AS DRAWN IN THE THIRD CENTURY A.D.

FIG. 2. DISTILLING APPARATUS AS DRAWN IN THE FIFTH CENTURY A.D.

tically pure water may be isolated from wine and other liquid mixtures by distillation. The alchemists obtained the mineral acids and other valuable substances by processes of distillation, and at the present day distillation is one of the most potent processes in the hands of the scientific and industrial chemist.

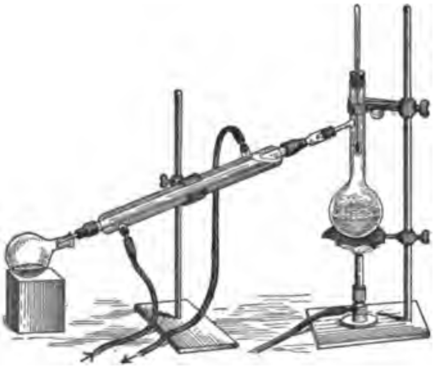


FIG. 3. MODERN DISTILLING APPARATUS.

What usually takes place during the distillation of a mixture is very simple: The given liquid becomes divided into portions of unequal volatility, every portion that distils over being more volatile than the portion that still remains behind. And as less volatile liquids boil at higher temperatures than more volatile ones, it is obvious that the boiling-point of a distilling mixture must continually rise. If the mixture were allowed to evaporate at constant temperature its vapor-tension must continually decrease. A liquid whose vapor-tension, during evaporation, might increase, is an impossibility for almost obvious reasons. Such a liquid and its vapor would constitute a system whose volume would increase, and not diminish, if some compressing power was brought to act upon it; which is absurd. Further, by means of such a liquid, it would be easy to obtain a form of what physicists call 'perpetual motion of the second kind,' which the science of thermodynamics recognizes as no less impossible than the creation of mechanical work out of nothing. (See THERMODYNAMICS.) But while the vapor-tension of an evaporating mixture cannot possibly increase, it may, and in certain cases does, remain constant. Thus a mixture of three parts of water and 97 parts of absolute alcohol will evaporate without change of vapor-tension. The question therefore remains, what mixtures are subject to decrease of vapor-tension, and what mixtures evaporate without such change. The answer is: If the ingredients are present in such proportions that the vapor-tension of the mixture is either the highest or the lowest that can be obtained with the given substances, then the vapor-tension will remain constant during evaporation; in every other case it will decrease. If for a certain proportion of the ingredients the vapor-tension of the mixture is lower than for any other proportion, the composition of the boiling liquid will approach nearer and nearer to that proportion as a limit; once that limit reached, the vapor-tension cannot decrease any further, and thenceforward the composition of the distilling liquid must remain unchanged: the vapor passing off and the liquid remaining behind will have precisely the same relative composition. Again, if at a certain temperature a given mixture has the highest vapor-tension that can possibly be obtained with its ingredients, then a separation into more and less volatile portions is evidently impossible, and hence the distillation can produce no change of composition. A mixture of 3 parts of water and 97 parts of absolute alcohol has, at its boiling-temperature, a higher vapor-tension than any other mixture of water and alcohol at the same temperature; and this is why that mixture distils over without change of composition.

From the above it may be seen that the possible changes of the total vapor-tension of a mixture determine in a general manner the direction in which the changes of composition will proceed in course of a distillation. To recapitulate, distillation can effect a change in the composition of a given mixture only if *both* of the following conditions are fulfilled: (1) If there exist mixtures of the same substances, whose vapor-tensions are *less* than that of the given mixture; (2) if there also exist mixtures of the same substances, whose vapor-tensions are *greater* than that of the given mixture. Distillation will then divide the given mixture into, say, two portions, one of which will be more, the other less, volatile than the given mixture. But the exact course of a distillation is far from being determined by these laws. For example, no answer is thus furnished to the question: being given a mixture of a pound of water and a pound of alcohol, and supposing that half the mixture has distilled over, what is the composition of the distillate? The total vapor-tension of a mixture, it must be remembered, is the sum of the 'partial' vapor-tensions of its ingredients. The relative amounts of the ingredients passing over at any moment are proportional to their partial vapor-tensions at that moment. The partial vapor-tensions in a mixture are known to be lower than the vapor-tensions of the ingredients in an isolated state. But what they are exactly is but seldom known. To determine them experimentally is a matter of considerable difficulty; and no theory is known which would permit of calculating them in all ordinary cases. Hence our knowledge of the process of distillation is as yet extremely meagre. An empirical rule capable of yielding some practical results has been proposed by Brown, and has been somewhat developed by Thomas, Barrell, and Young. But it is by no means sufficiently established to require explanation here. The modern theory of solutions, too, has been brought to bear on the problem of distillation; but that theory permits of calculating the partial vapor-tensions only in mixtures containing a very large excess of one of the ingredients ('dilute solutions'), and hence cannot furnish a sufficiently general solution of the problem of distillation.

It remains to notice briefly the processes of fractional distillation and distillation with a reflex condenser kept at constant temperature. In fractional distillation, which is very frequently employed by organic chemists, a mixture is first divided into a series of 'fractions' by distillation; then the fractions are subdivided by further separate distillations; then some of the fractions are mixed together in pairs or threes, the resulting liquids again distilled separately, and so forth until the required separation has been effected. If a condenser is attached to the still in such a manner that any liquid forming in it may flow back into the still, and if the temperature in this condenser is kept constant, then the vapors passing out of it uncondensed are found to have the same relative composition, no matter what changes of composition are taking place in the distilling liquid. In most cases examined (but not in mixtures of alcohol and water), the distillate thus obtained is found to boil exactly at the temperature at which the condenser has been kept. See CHEMISTRY; BOILING-POINT; EVAPORATION; DISTILLED LIQUORS.

DESTRUCTIVE DISTILLATION. This is quite different from the process described above. For while that process is purely physical and involves no chemical change whatever, destructive distillation, as implied by the term, causes profound chemical changes in the materials subjected to it. Examples of destructive distillation are: the heating of coal in gas-works at a red heat, when it resolves itself into coke, which is left in the retort, and coal-gas, naphtha, tar, etc., which distil over into suitable receivers; the treatment of coal at and below a red heat, when it yields much paraffin oil; and the distillation of wood in close vessels, at a red heat, when charcoal is left in the vessel, and wood-vinegar, wood-spirit, tar, etc., pass over in vapor, and are condensed. See TAR; COAL-TAR; GAS, ILLUMINATING; PARAFFIN; ACETIC ACID; DIPPEL'S ANIMAL OIL; etc.

DISTILLED LIQUORS, or ARDENT SPIRITS. Alcoholic liquors manufactured by the process of distillation (q.v.). They may be produced from fermented liquors or directly from the raw materials, which must contain a large percentage either of sugar or of starch. An example of the first class is brandy, which is made by distilling wine. An example of spirit produced from saccharine material is rum, which is made from molasses, while whisky, made from corn, rye, barley, or other cereal, is an example of spirit made from a starchy material. The process of distillation may be so conducted as to produce an alcoholic beverage or simply a 'raw spirit.' From the latter, by a process described below, is obtained the rectified spirit which is used as a basis in the manufacture of various alcoholic beverages. Rectified spirit is also employed in the arts, and from it, by a process of purification, is obtained the absolute ethyl alcohol of the chemist. See ALCOHOL.

HISTORY. All the intoxicating drinks used in ancient times seem to have been the product of fermentation only. The art of distilling liquors is first mentioned by an Arabian physician of the tenth century, Albukassen by name, though the invention is attributed by some to the northern nations. The name *aqua vitæ*, given to distilled spirits, shows what an estimate was put upon the discovery by early physicians and alchemists. One of them "declares this admirable essence to be an emanation from divinity, an element newly revealed to man, but hid from antiquity because the human race were then too young to need this beverage destined to revive the energies of modern decrepitude."

PROCESS OF MANUFACTURE. Spirits were first distilled from wine, but an endless variety of substances are now used in their manufacture. Alcohol, however, is the essential element in all spirits. It results from the decomposition of sugar, which, by the process of fermentation, is resolved into carbonic acid and alcohol. Sugar is therefore the direct source of alcohol, and for this reason sweet vegetables and fruits may be converted into spirits. But starch is readily converted into sugar by means of the substance called diastase, which is found in malt and in germinating seeds generally. (See BEER and BREWING.) Hence, starchy as well as sweet vegetables may be used in the manufacture of spirits. In making distilled liquors, when the raw material is a fermented liquor, it is ready to be distilled without further preparation; when it is a sugar, however, it must first be fermented and then distilled; when it is a starch, another initial process, to convert the starch into sugar, is necessary.

MASHING OR PREPARATION OF THE WORT. To saccharify the starch is the object of the initial process, technically known as *mashing*. This process consists in mixing the raw grain, properly ground, with malt and with water at a temperature of about 150° F. Barley, oats, and rye are the grains commonly used. In England and the United States most distillers use a mixture of raw and malted grain, in which the larger proportion is raw. The first mashing requires from one to four hours, during which time the mash is kept at a uniform temperature of 145° F. by successive additions of hot water. After this saccharine infusion, technically called *wort*, has acquired its maximum density, as indicated by a saccharometer, it is drawn off. Fresh water is then poured upon the residue and allowed to stand to form a second wort. This is added to the first. A third wort, used to infuse a new mixture of grain, is sometimes made. In this method of direct mashing, nearly 10 per cent. of the grain is not decomposed. The waste may be reduced to 5 per cent. by heating the grain and water before the malt is added.

In Germany, where potatoes are used for the manufacture of spirits, the potatoes are steamed before the malt is applied. This is advisable because potatoes contain a much smaller proportion of starch than the cereals. By steaming, the starch-cells are thoroughly broken and the starch reduced to a condition in which it is easily acted upon. Several different forms of apparatus have been devised for this purpose. In that of Henze, which is largely used, the steam is applied under pressure and the potatoes are reduced to a pulpy liquid, in which form they run into the mash-tub from an opening in the bottom of the apparatus. After this mass has cooled to the proper temperature, the malt is added and the wort formed as described above.

FERMENTATION. This is effected by adding either brewer's or compressed yeast to the wort prepared as described above; or to a saccharine liquid obtained from molasses, beets, or other sugar-producing fruits or vegetables. Eight to ten parts of brewer's yeast are mixed with 1000 parts of grain mash, and with a larger proportion of yeast for potato mash. The chemical processes involved in fermentation, by which the sugar is resolved into carbon and alcohol, are discussed under YEAST and FERMENTATION. From three to nine days are consumed in fermentation. The process is continued until the density of the liquid ceases to lessen, as indicated by the saccharometer. Hydrofluoric acid is quite generally used in the fermentation process. Sadtler states, in his *Industrial Organic Chemistry* (New York, 1896), that the following advantages are claimed for its use: "(1) by preventing the losses due to secondary fermentation the alcoholic yield is increased; (2) this yield is especially maintained when raw materials of somewhat inferior quality are used, when, without the hydrofluoric acid, the yield would be diminished; (3) the development of foaming in the fermentation is largely prevented."

In making spirit from beets, sulphuric acid is used during the fermentative process. Much of the beet-spirit is made from molasses derived as a by-product from the manufacture of beet-sugar. But in France it is customary to make inferior beets directly into spirit. Only a small quantity of yeast is required, and fermentation is completed in about twenty-four hours. In the West Indies, the molasses produced in making cane-sugar is utilized in the manufacture of rum. (See the article RUM for a description of its manufacture.) The addition of yeast to the saccharine liquid is unnecessary, because enough wild yeast is present in the molasses to produce *spontaneous* fermentation.

DISTILLATION. The operations thus far described are merely preliminary. They differ from those employed in the two fermentation industries, wine and beer making, in that in preparing the liquor for distillation the fermentation process is carried to its furthest limit in order to produce the greatest possible amount of alcohol. The liquid thus prepared for distillation is technically known as the *wash*. The *still* is the apparatus in which the wash is reduced to vapor and then condensed. In its oldest and simplest form the still consists of a copper vessel, provided with a closed head, connected with a spiral tube, called the *worm*. The latter is placed in a refrigeratory, or closed, chamber, through which cold water is constantly passing. When heat is applied at the still the spirit begins to rise in vapor, along with more or less steam; these vapors pass through the worm, become condensed by the cold, and drop or trickle down into the receiver. The product of the first distillation in a simple still is a weak and impure liquid technically known as *low wines*. This is then redistilled at a lower temperature to deprive it of the water and of the fetid oils which have passed with the alcohol.

In 1801 the first great improvement in distilling was invented by a workman of Montpellier named Adam. By making the vapors rise from the still through a series of winding passages, maintained at a determinate degree of heat, and deposit part of the water and other impurities, he was able to obtain from wine a spirit of any required degree of purity at one operation. This device was applied by Pistorius to the distillation of washes made from grains. Within recent years many inventions have been made to produce the purest and strongest alcohol at the lowest possible cost. Sadtler divides the different forms of distilling apparatus into five general classes: (1) The simple stills already described, with worm-condenser heated by direct firing. (2) The simple stills with closed 'wash-warmer.' This is a device for saving fuel by causing the pipe containing the hot vapors on their way to the refrigerator coil to pass through a vessel containing the wash. Thus the wash is heated to a considerable degree before it enters the still at all. (3) Stills with rectifying 'wash-warmer.' This is a device invented by Dorn, in which the vessel through which the vapor pipe passes is divided into two compartments by a sheet of copper. The upper and larger compartment serves as a wash-warmer. Through it the tube conveying the vapors from the still passes into the lower compartment, where at first the distillate is condensed. But as the wash is warmed by the vapors from the still, the distillate in this compartment gives off alcoholic vapors which pass on and are condensed in the worm, while the watery portion is allowed to run back into the still. This rectifying action can be increased by introducing two or more chambers between the still and the final condenser. (4) Stills with wash-warmer, rectifying, and dephlegmator apparatus for intermittent working. (5) Stills with similar apparatus for continuous working. A dephlegmator is an apparatus for partially condensing the vapor, by means of metallic diaphragms. The vapor, coming in contact with these metallic sheets, is chilled, and the watery portion, which condenses most readily, separates and flows back, while the alcoholic vapors pass on through the pipes to the condenser. The Pistorius apparatus, already referred to, is an intermittent dephlegmator. The original invention has been improved successively by Gall, Schwartz, and Siemens, and is much used in Germany in making potato spirit. Examples of the fifth class of stills, those with a continuous dephlegmator apparatus, are the Coffey still, used in England for making grain spirit, and the Savalle still, used in France in distilling brandy. The Coffey still is particularly well adapted to the manufacture of what is known as 'silent spirit,' that is a spirit which is very strong and pure, but nearly destitute of flavor. For the manufacture of beverages it is not so well fitted because it removes, along with other impurities, a large proportion of the volatile oils which give them their peculiar flavor. For the principles involved in the process see DISTILLATION; EVAPORATION; BOILING-POINT.

PURIFYING THE DISTILLED SPIRIT. If alcohol and water were the only substances that pass over in distillation, all spirits, from whatever source, would be the same. But, except to a partial extent in the Coffey still, this is not the case. Brandy, rum, and whisky owe their distinctive flavors to essential oils derived from the grape, from sugar, or from grain. Other impurities also pass over which are unpleasant and unwholesome. The mellowing effect of age upon spirits is said to be due to the evaporation or spontaneous combustion of these oils. Newly distilled spirits are in general fiery and unwholesome. The process of removing the impurities from the spirit, by fractional or repeated distillation, is known as *rectifying* the spirit. The spirit that is first condensed, in rectifying, is crude and milky. Next comes the clear alcohol, which is caught separately. Last of all comes a weak spirit called *faints*, which is returned to the still. There are certain impurities which cannot be removed by distillation. Fusel oil is one of these persistent impurities. Several chemical methods have been proposed for its removal, but the method usually employed is to filter the alcohol, diluted with equal parts of water, through wood charcoal. A process which has been used experimentally consists in mixing the diluted spirit with petroleum and thoroughly agitating the mixture. The petroleum has the power of withdrawing the fusel oil from the mixture. Absolute or anhydrous alcohol cannot be obtained by distillation. (See ALCOHOL.) Rectified spirit of wine is the most concentrated alcohol producible by ordinary methods of distillation. The rectified spirit of the British Pharmacopeia has a specific gravity of 0.834 and contains 85.65 per cent. alcohol by weight. The alcohol of the United States Pharmacopeia has a specific gravity of 0.816 and contains 92.3 per cent. by weight. Proof spirit is a term applied to alcohol which conforms to the standard of the excise laws of the United States and England. English proof spirit has a specific gravity of 0.91984 and contains 49.24 per cent by weight. United States proof spirit has a specific gravity of 0.93437 and contains 42.7 per cent. by weight. Alcohol is lighter than water (as 793 to 1000), and thus the lighter the liquid, the purer it is.

BEVERAGES MADE FROM RECTIFIED SPIRIT. Whisky, brandy, and rum are distilled liquors used directly as beverages. But much of the distilled liquor produced is in the form of silent spirit, and is used to fortify wines and to arrest fermentation in them at any desired stage, and in the manufacture of factitious beverages generally. There is a large class of alcoholic beverages which are made by mixing with alcohol or brandy various aromatic substances. These distilled spirits are discussed under LIQUEURS.

BIBLIOGRAPHY. Brannt, *Practical Treatise on the Raw Materials and the Distillation and the Rectification of Alcohol, and the Preparation of Alcoholic Liquors, Liqueurs, Cordials, and Bitters* (Philadelphia, 1886); Gaber, *Der praktische Destillateur und Spirituosen-Fabrikant* (Vienna, 1901); Maercker, *Handbuch der Spiritusfabrikation* (Berlin, 1899), of which there is a French translation by Bosker and Warnery, entitled, *Traité de la fabrication de l'alcohol* (Lille, 1889); Roux, *La fabrication de l'alcohol*, in seven parts (Paris, 1883-90). See LIQUORS, FERMENTED AND DISTILLED, STATISTICS AND HISTORY OF; BRANDY; WHISKY.

DISTILLED WATER. Water obtained by subjecting ordinary water, which contains more or less non-volatile matter in solution, to a process of evaporation and by condensing the vapors in a separate vessel. Evidently, distilled water can contain no fixed matter, although it may and usually does hold volatile organic matter in solution. Distilled water finds extensive use in the preparation of medicines and in the chemical laboratory, where the use of natural water would yield inaccurate results. Owing to the absence of mineral salts, distilled water has a flat and an insipid taste. To eliminate this, ordinary distilled water may be redistilled with a small amount of potassium permanganate.

Distilled waters is also the name applied in the manufacture of perfumes to the water containing the volatile, odorous, and aromatic principles of plants and flowers that pass over on distillation, as lavender water, rose water, etc.

DISTINGUISHED SERVICE ORDER. A military Order instituted in 1886 by Queen Victoria for the purpose of rewarding army and navy officers. Appointments to membership are made by the sovereign, the head of the organization, for gallant service in the field or on sea, specially mentioned in dispatches to the Government. Its members wear a gold cross, bearing on one side the imperial crown, and on the other the initials V. R. I.

DISTORTION. See LIGHT, section on *Lenses*.

DISTRESS (OF. *destresser, destrecier, destroisser*, from Lat. *distringere*, to pull asunder, from *dis-*, apart + *stringere*, to draw tight; connected with Lith. *stregti*, to freeze). An ancient creditor's remedy, common to all systems of primitive law, which consists in the seizure and detention by the creditor of his debtor's goods. It is one of the few survivals in our law of the practice of the personal enforcement of one's legal rights, without the intervention of the courts or the assistance of officers of justice. Originally applicable to a great variety of cases, it is now restricted to a limited number of situations, where its drastic character is mitigated by the relation of the parties to one another, and is strictly regulated by law.

Blackstone describes distress as "the taking of a personal chattel out of the possession of the wrong-doer into the possession of the party injured, to procure a satisfaction for the wrong committed." Even in Blackstone's time, however, the scope of the remedy had been greatly narrowed, and he enumerates only two principal cases in which it was still available: (1) for non-payment of rent or other duties annexed to the tenure of land; and (2) in the case of cattle of a stranger trespassing and doing damage (*damage feasant*) on one's land. It is still employed in these cases in England and in many of the United States. It was a remedy of feudal law, inseparable from fealty to the lord, and incident to every service. It does not seem to be very popular, however, as a means of collecting rents, as it places the landlord in a better position than the other creditors. In several of the New England States distress has given place to an attachment on *mesne profits*. In New York and several other States it has been expressly abolished by statute, and in North Carolina it is held to be inconsistent with the spirit of the laws and not to exist in that State. The law of Louisiana permits the landlord to follow his tenant's goods for fifteen days after removal from the premises. In general, in English and American law, the right to distrain is not limited to the goods of the debtor himself, but extends to any goods in his possession, whether belonging to him or not. But certain articles, as beasts of the plow, implements of trade, and any article at the time in personal use or occupation, have always been privileged from distress. So, also, where the owner, not being the debtor, is compelled by necessity to place his goods on the land, or where he does it for commercial purposes; as, in the first instance, the goods of a traveler at an inn, or, in the second, goods deposited in a warehouse on storage. Formerly the remedy of distress was limited to the seizure and detainer of the goods until the claim sought to be enforced was paid, the distrainor having no right to sell the goods, and the debtor, if he claimed the distress to be illegal, having recourse to an action of *replevin* (q.v.), for their recovery. Now, however, by statute goods taken under distress may often be sold after due advertisement at public auction and the claim of the distrainor satisfied out of the proceeds. In such a jurisdiction, the character of the remedy by distress has been completely changed from a species of legal duress to a variety of attachment or execution. See LANDLORD AND TENANT; RENT.

Consult: Blackstone, *Commentaries on the Laws of England;* Maine, *Ancient Law* (New York, 1872); *Lectures on the Early History of Institutions* (6th ed., London, 1898); Gilbert, *Treatise on the Law of Distresses and Replevins* (1st ed., London, 1757); Bullen, *Practical Treatise on the Law of Distress for Rent* (London, 1842); and the authorities referred to under LANDLORD AND TENANT.

D'ISTRIA, dē̆'strê-ȧ, DORA. See DORA D'ISTRIA.

DISTRIBUTION (Lat. *distributio,* from *distribucre,* to distribute, from *dis-,* apart + *tribuere,* to give, from *tribus,* tribe). The department of political economy devoted to the consideration of the rewards which are allotted to the several factors in production. It is a familiar axiom of political economy that land, labor, and capital are united in the production of goods, and that to each is accorded a share of the product. Distribution studies the laws which govern the recompense of the several factors, and thus includes the law of rent, the law of wages, and the law of interest and profits. It is assumed that the three factors are in possession of three different sets of persons, although this is not essential to the formulation of laws. The union in one person of two of the factors would give to him a mixed reward, the components of which would be governed by different laws. There has been a tendency in recent years to draw more sharply than formerly the line between interest and profits, to distinguish between the owner of capital, who receives interest, and the employer of capital, who receives profits. This distinction is of increasing importance in the modern world, which, with its extension of credit, permits so large a share of the world's business to be carried on by borrowed capital, and places opportunities at the disposal of energetic and enterprising men which did not exist before. The area of discussion thus outlined represents the most controverted field in economic writing. It has assumed prominence especially through the attacks of the socialists, whose contention is that the distributive process is radically at fault, and thoroughly inequitable. It is interesting to observe that as the discussion of exchange gave place in Adam Smith's writings to that of production, so later, in the writings of Malthus, Ricardo, and Mill, distribution became the leading element in economic discussion. The interest shifted somewhat from questions affecting the increase of the aggregate product to the consideration of the laws governing the distribution of the product.

Consult the works of Ricardo, John Stuart Mill, Cairnes, Marshall, Jevons, Walker, Clark, and Patten. See POLITICAL ECONOMY; INTEREST; PROFIT; and RENT.

DISTRIBUTION. In its most general sense in the law, the division of a surplus fund among those legally entitled to share therein. It applies equally to the division of a trust fund among the *cestuis que trust,* of the surplus assets of a bankrupt or insolvent among the creditors, of partnership property after payment of debts among the co-partners, and of the surplus in the hands of an administrator of an intestate among those entitled, as next of kin or otherwise, to share it among them.

Distribution usually refers to the last of these, and the statutes which have been enacted in Great Britain and in the United States to regulate the distribution of an intestate's personal estate are known as statutes of distribution. The matter is one wholly of statute regulation at the present time.

Formerly the personal estate of one dying intestate passed at once into the hands of the bishop of the diocese, and the disposition made of it was determined by the ecclesiastical law, administered by the so-called 'ordinary court' of the diocese. There seems originally to have been no provision for the payment of the debts of the decedent, and the bulk of the estate, after deducting some small provision for the widow and children, was devoted to the purposes of the Church (*in pios usus*). It was, however, as early as 1285, provided by statute (St. Westminster II. c 19) that the ordinary should pay the intestate's debts just as an executor was bound to do, and in 1357 it was further enacted (31 Edw. III. st. 1, c. 11) that the ordinary should commit the administration of the intestate's goods to his next and most lawful friends. The jurisdiction of the ecclesiastical courts over the administration of decedent's estates, whether testate or intestate, continued in England till 1857, when it was transferred by act of Parliament to the newly created Court of Probate. It is now vested in the Probate, Divorce, and Admiralty Division of the High Court of Justice, instituted by the Judicature Act of 1873. In the United States separate courts of this character, known variously as surrogates' courts, probate courts, ordinary courts, and orphans' courts, have existed from the earliest period for the exercise of this jurisdiction.

The administration of decedents' estates includes (1) the payment of funeral expenses, of the costs of administration, and of the decedent's debts; (2) in the case of an executor, the payment of the legacies given by the will; and (3) in the case of either an executor or administrator, the distribution of the surplus, if any, among those entitled thereto under the statutes of distribution.

The feudal law of land, which confined the descent of real estate to a certain person or class of persons, taking as heir of the intestate, had no application to the transmission of the personal estate. That was from the beginning distributed on a more rational and humane plan, due, in large part, at least, to the mild influence of the canon, or ecclesiastical, law. It has been noticed that in the earliest period the right of the widow and children to share reasonably (*partes rationabiles*) in the decedent's estate was recognized. The same principles prevail to-day. There is a much less rigid classification of those who stand in the order of distribution than is the case in the law of the descent of land, and there is nothing resembling the feudal preference of the male to the female, of the elder to the younger, of the whole to the half blood. In England the matter is regulated by the statutes 22 and 23 Car. II., c. 10 and 1 Jac. II., c. 17, known as the Statutes of Distribution, and the order of distribution provided for by them follows closely that of the early law to which reference has been made. Similar statutes have been enacted in all of the United States, but these, though governed by the same principles and alike in their general outlines, vary considerably in detail. In general it may be said that if a man die, leaving a wife and children, one-third of the personal estate goes to the wife and the remaining two-thirds to the children. If there be a wife and no children, the wife takes one-half, the other half going to the next of kin of the deceased. If there be children and no wife, the children take the whole estate to the exclusion of other kindred. In England and in many of our States the position of a surviving husband is better than that of a surviving widow. The old common-law rule, that the husband is solely entitled to the personal estate upon the death of the wife, has been generally abrogated in the United States where there are also surviving children, and in many of the States his position has been completely assimilated to that of the wife. For a more detailed and exact statement of the order of distribution of intestate's estates, the reader is referred to the statutes of the several States. See the articles on ADMINISTRATION; DESCENT; EXECUTOR; and the authorities there referred to; and also Stimson's *American Statute Law*, vol. i. (Boston, 1886).

DISTRIBUTION OF ANIMALS, or ZOÖGEOGRAPHY. Knowledge of the geographical distribution of animals, and their faunal relations past and present, constitutes a very important part of the science of zoölogy. An animal's environment exerts a formative influence upon its character and structure. Knowledge of its habitat and that of its species, together with such changes as the area and range may have undergone, is therefore essential to a full understanding of the natural history of any kind of animal or animals.

CONDITIONS CONTROLLING HABITAT AND RANGE. Some animals are fitted to dwell wholly upon land, others in water. The aquatic animals are, further, divisible into those of salt and those of fresh waters. The former have the oceans of the world open to them, yet few, if any, range through all seas; furthermore, the inhabitants of the surface of the sea differ from those of its bottom or deeper parts. Similarly, animals able to mount into the air and to fly abroad with apparent freedom, are rarely cosmopolitan, and whole groups of these, as well as innumerable species and individuals, reside only within limited areas or along narrow lines of migratory travel. Fresh-water forms are likely to be restricted to separate lakes and river systems. Of the terrestrial animals none are now cosmopolitan, except those which have been carried by man to all parts of the world. (The introduced fauna of a region must always be distinguished from its indigenous fauna.) On the contrary, each of the present grand divisions of the earth has a characteristic fauna of its own, and often a whole family, order, or even subclass, belongs to one continent alone. Coincident with these restrictions and diversities, likenesses between widely separated lands are manifest; and representatives of a single group may be found in regions far distant from one another. To set forth these facts, to endeavor to account for them, and to develop their significance, is the province of zoögeography.

LIMITS OF DISPERSION: THE SEA AS A BARRIER. Each kind of animal must have had a point of origin, whence it spread as it increased. Theoretically, the expansion of a species would proceed equally in all directions, but actually this expansion has encountered barriers and restrictions that have confined and shaped habitats within certain areas, in some instances extremely wide, in others surprisingly narrow. What constitutes these barriers and restrictions? That depends in each case on the physical surroundings as related to the needs and abilities of the animal in question. It is plain that a species of fish that originated in or somehow became restricted to an inland water—Lake Baikal, for example—could never spread beyond its shores save by accidental transplantation; while an able sea-going fish may wander indefinitely, so far as mere room is concerned. Among land animals space for expansion, then, is of prime importance. Here the firmest bounds are set by the sea. Any considerable breadth of water, and especially of salt water, is uncrossable except by rare and extraordinary accident; and even then a pregnant female or a pair must be landed on the further shore in order to start a colony, which must, furthermore, find favorable surroundings in order to survive in the new locality. This accounts for the fact that mammals and terrestrial reptiles and amphibians are absent from oceanic islands. Continuity of land, then, is necessary to the spread of a terrestrial species; and when species are found in regions now widely separated, as Europe and North America, it can usually be shown that such regions were formerly connected by lands now submerged. Conversely, the characteristics of the present fauna of such comparable regions assist the geologist to determine when the connection was finally broken.

INSULAR FAUNAS. The faunas of most islands near continents date back to the time when these islands were a part of the adjacent mainland, or were separated from it only by narrow straits. The explanation of the broad and conspicuous disparity that exists between the faunas of such large islands as Australia and Madagascar, and those of Asia and Africa, respectively, is accounted for by the evidently very ancient date at which they became dissevered. "It is evident," remark Flower and Lydekker, "that Australia has been isolated from the Asiatic Continent from some very remote geological epoch, at which period it is probable that monotremes and marsupials were the dominant if not the sole representatives of the mammalia then existing. Consequently Australia has never been able to receive an influx of the Eutherian orders, which have probably swept away all the marsupials except the small American opossums from the rest of the globe. Again, the large island of Madagascar, which has a fauna of an African type, but still very markedly different from that of the mainland, may be considered to have been connected with the latter at a time when the Eutheria had become the dominant forms, but has been separated for a sufficiently long period to have enabled a large number of its species and genera to have become distinct from those of the adjacent continent. Similarly there is evidence to show that South America was probably cut off for a considerable period from the northern half of the American Continent, in consequence of which its lowly organized fauna of Edentates were enabled to attain such a remarkable development in the later geological periods. Consult Wallace, *Island Life* (New York, 1902). See ISOLATION.

"The above instances [and their converse, exemplified by the identity of insular and continental faunas where a land union is known to have existed lately] are sufficient to show . . . how largely the present distribution of mammalian life is bound up with the past history of our globe. We must, however, not omit to mention another very important agency of past times which has likewise had great influence on the present distribution of the various faunas of the Northern Hemisphere. This is the so-called Glacial Epoch, which took place immediately before the establishment of the present state of things, and appears to have been the cause of the extinction of many of the larger mammalian types which formerly inhabited Europe."

But while many species have had a far wider distribution in past ages than now (and in a general way a widely distributed form may be regarded as an old form), many species seem never to have expanded much, some being limited to a short stretch of coast, or a single river-valley, or to a certain mountain or island.

DESERTS, MOUNTAINS, ETC., AS BARRIERS. Other barriers than the sea, therefore, have been effective in impeding the spread of crescent varieties, species, and groups. Most prominent among these is a desert region. The Sahara cuts off almost completely the fauna of Europe from that of Africa; and the continuation of the arid treeless area northeastward across Asia divides the northern Asiatic animals from the southern in a most emphatic way. Similarly, the fauna of North America stops and that of the southern continent begins where the plains and tablelands of Arizona and northern Mexico interpose a waterless, scantily planted space of semi-desert and sterile hills, uninviting to either set of animals as a whole, yet invaded by both.

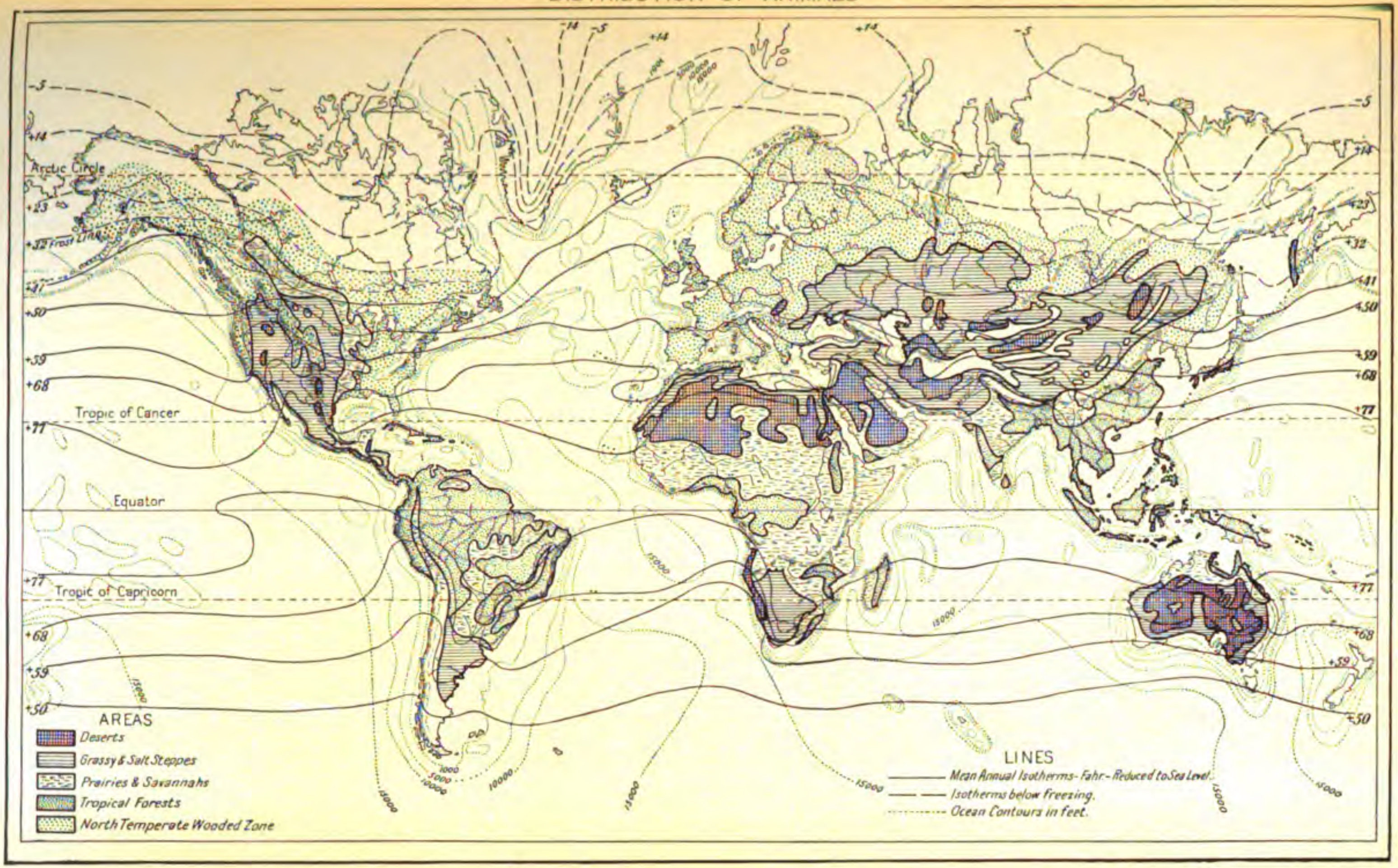
Long and lofty mountain ranges stand next in importance, probably, as physical barriers, but this is more marked in the warmer than in the cooler parts of the world, since animals accustomed to the torrid conditions of tropical plains cannot or will not endure the cold and lack of customary food encountered even on the passes, and so do not cross over the highlands. The mountains of North America seem to make less difference with the distribution of our animals, as between the Atlantic and Pacific slopes, than does the central-plains area; and that of Europe has been little affected by the presence of mountains. The Atlas range is more marked as a boundary, but that is because of the neighboring desert; and similarly the great Central-Asian ranges are part of the lofty, cold, and arid region which as a whole forms probably the most effective inland barrier in the world.

Deep and broad rivers or straits of the sea may interrupt the spread of many species. The Hudson seems never to have been crossed by the opossum, which could neither get over nor around it. The Mississippi put an end to the eastward progress of the jaguar along the Gulf region, and much smaller rivers might stop many other creatures, such as monkeys (which are unable to swim); yet none would prove a barrier to flying or amphibious animals, and many serve to extend hundreds of miles the range of aquatic and semi-aquatic ones.

Frequently, however, neither these nor various other 'barriers' that might be mentioned seem to have prevented the growth of species which nevertheless are scant in numbers and extremely restricted in area of range. The blaubok (q.v.) of South Africa was unknown beyond a single valley, and has almost become extinct. This is a sharp example of many puzzling cases where probably the restraining influence has been competition. Each locality supplies food, water, and shelter for only a certain quota of animals. The ablest and best-fitted in each class for that region will get the most out of it and will increase and spread. The 'struggle for existence' is everywhere a real daily fight for space and subsistence, and the weakest will gradually succumb or become prisoners within areas so peculiarly favorable to them that there they are able to hold their own. The powerful and gregarious cattle long ago forced the sheep to keep to the mountain pastures. Active enemies must also be considered, certain animals not being able to exist in the same territory. A river infested with crocodiles might forever prove uncrossable for small quadrupeds that otherwise might soon pass over it. The faunal distinctions between forest and prairie, mountain and plain, diurnal and nocturnal methods, are effects of enmity as well as of competition.

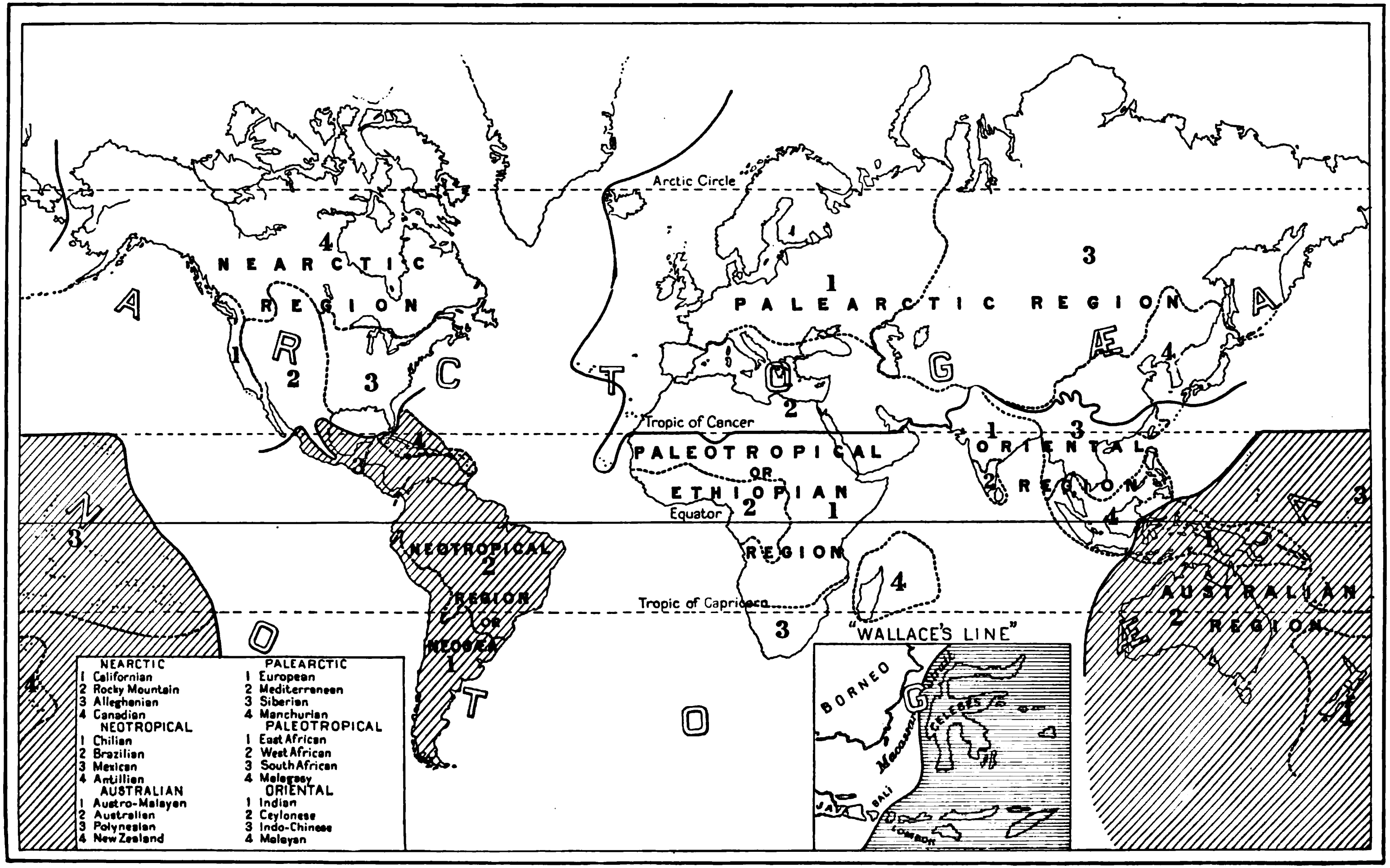
CLIMATE AND ALTITUDE AS FACTORS. Of climate as a determinant in geographical distribution, perhaps too much has been made in the past. Climate, within its extremes, seems influential upon animal life mainly as cold or prevailing drought affects the higher forms of vegetation (see DISTRIBUTION OF PLANTS), and consequently the food of herbivorous and insectivorous animals. Such species as can take a varied fare, and can by migration, storage of food, or hibernation, escape or provide against storm and scarcity, defy climatic bounds. The big cats and bears range from torrid jungles to snowy mountain-tops and subarctic latitudes. Transplanted species frequently flourish in climates the opposite of that to which they are native. In a general way, nevertheless, similar animals are found in similar climates, and within the larger regions lesser faunal divisions often conform closely to isothermal belts, a fact more noticeable in North America than anywhere else. Here, too, comes in the so-called 'vertical' distribution of life observable in high mountains, where various altitudes exhibit an animal and plant life identical with or similar to that of northern latitudes, where a corresponding average of temperature prevails. Thus mountain ranges lying north and south carry far toward the equator along their cool ridges species which exist near sea-level only in high latitudes. Our bighorn, once numerous along the Rockies south to New Mexico, is an example of this feature; and the guanaco of Patagonia, following the Andes north to the equator in Ecuador, is another. Terrestrial life is everywhere most plentiful near sea-level and in warm regions, and becomes more scanty as the poles are approached or mountains are ascended. Mountain-tops, however, frequently

DISTRIBUTION OF ANIMALS



PHYSICAL FEATURES OF THE EARTH AFFECTING DISTRIBUTION OF LIFE

DISTRIBUTION OF ANIMALS



ZOOGEOGRAPHICAL REGIONS

form refuges for animals elsewhere known only in subarctic regions, which were left on their lofty and now isolated homes from the time when semi-glacial conditions prevailed over the whole district.

DISTRIBUTION WITHIN THE SEA. Related to climatic influences on land are those conditions in the sea which set invisible bounds to the spread of most marine animals, even when apparently at full liberty to go anywhere. A few species of big whales, sharks, and predatory fishes are known in all parts of the oceanic world, and even individuals are often very far-ranging. Some others are spread throughout all the northern seas, or all the southern, as the case may be; but of tropical marine animals very few are common to both the Atlantic and the Pacific. On the contrary, the distribution of marine animals of every sort exhibits local restriction as fully as does that of land animals. Marine animals may be divided into three classes as relates to the present theme, namely the Littoral Fauna, Pelagic Fauna, and Abyssal Fauna. To the first belongs the crowded life of the shore region, where the rocks and forests of kelp, coral reefs, and natural bottom from high-water mark down to 100 fathoms or so of depth, are the home of a vast number and variety of fixed and moving creatures of the lower orders, and a host of higher arthropods, fishes, and cetaceans which live among or upon them. These vary with the conditions. They are most abundant in the tropics and decrease toward the poles. Drifting sand and mud are nearly barren, but rocky shores are populous. Currents of cold water affect a coast unfavorably, while warm currents bring and sustain many species. Thus physical and climatic conditions influence the amount and distribution of shore life beneath the water much as they do that above it.

The 'pelagic' fauna includes those animals which habitually dwell upon or near the surface of the open ocean, visiting all parts of it. They may be able to swim actively and so move at will here or there, and such form the class 'nekton,' or, like the jelly-fishes and salps, may only float and be drifted about by winds and currents (the class 'plankton'). Even here, however, certain species and groups are to be gathered only in certain parts of the sea; and their range seems to be limited mainly by factors of temperature. Thus the fauna of the Gulf Stream is distinct from that of the Atlantic for a considerable distance north of Florida.

BATHYMETRIC DISTRIBUTION. A new element enters into the question of the distribution of life in the sea, namely, variation in depth. This is comparable, in reverse, to hypsometric distribution, or that according to height above sea-level. Layers of animal life, as it were, may be observed from the shore line to the greatest explored depths. Most of the creatures to be found between tide-marks are absent or rapidly decrease below a few fathoms, while many rarely approach the shore, but are numerous on bottoms covered by 100 to 300 fathoms of water. Another zone belongs mainly or exclusively below that; and the globigerina ooze (q.v.), covering the ocean bottom with grayish mud in most parts of the world, from 400 fathoms down to about 2000 fathoms, has a distinct fauna of its own. Below 2500 fathoms the sea-bottom is formed of red clay, in which shells are absent, having apparently been dissolved during their descent to the greater depth. Even here, however, is found an abyssal fauna chiefly of fishes, "often of a very grotesque appearance."

This bathymetric distribution, from the 100-fathom line down, depends upon the factors of temperature and density. The former would be influenced by the ocean currents, and the animal life in the path of an influx of water from the polar regions would be different from that in the path of a warm current. The abyssal fauna is one habituated to such a degree of cold as would instantly kill much of the littoral or surface fauna. In addition to this powerful localizing influence, that of density, increasing with depth of water, is supreme as limiting the upward and downward range of animals habituated to a certain stratum—that is, to a certain average degree of water-density. Surface animals would be smothered at a mile of depth; and those brought by dredges from the abysses are usually found to be burst to pieces by the expansion of the air in their cavities and tissues. Thus vertical as well as horizontal limits are set in the sea. Too little is known of the abyssal fauna to say whether its members are world-wide or restricted to local areas; but, as the conditions in the deep ocean-basins are nearly uniform and undisturbed, it is probable that all the life is widely distributed. See DEEP-SEA EXPLORATION.

FRESH-WATER LIFE. The fresh-water fauna presents certain characteristic features, and is divisible into 'fluviatile' forms, inhabiting streams and rivers, and 'lacustrine' forms, inhabiting large lakes, where, as in the sea, the life is divisible into 'littoral,' 'pelagic," and 'deep-water.'

DISPERSION. The slow or rapid spread of a species from its point of origination will depend upon its powers of locomotion and its adaptability to new circumstances. In the mammalia this is a matter of walking and swimming. Some are excellent swimmers, and the great spread of the tiger throughout the Orient is mainly due to his natatorial ability. The faculty of flight has made bats more nearly cosmopolitan than is any other order of mammals. The wings of birds and insects give them a superior means of dispersal; flightless birds are, and always have been, much more circumscribed than the fliers. Reptiles and amphibians are poorly provided with means of locomotion, and are often very sluggish, while fresh-water fishes, except anadromous ones, usually dwell in confined waters. As for the mollusks, lower orders of insects, worms, and small sedentary animals of the shores, their principal, and often sole, resource is in the spread of their eggs or free-swimming larvæ. Mechanical aids, however, render important assistance in the dispersal of certain species, as is the case with so many plants. Land animals, large or small, frequently float across spaces of sea on ice cakes or driftwood, and some islands have undoubtedly been colonized in this way; yet it is a remote chance to trust, for unless a pair or a pregnant female were thus transported, no gain would result. Parasitic animals are carried about by their hosts. Small crustacea and mollusks may be carried great distances by wind, or by adhering to the feet of birds. Infusoria, the eggs of rotifers, and other microscopic forms may be transported in the dried condition by the wind. Darwin brought forward much curious information on this subject in the second volume of his *Origin of Species* (London, 1882).

It will be seen that the varying abilities among the different groups of animals would make their distribution very different from one another. Salt water is a poison to larval amphibians, while birds may fly across more than 1000 miles of sea space. Mammals may run about rapidly, while the reptiles and small invertebrate creatures must creep slowly or not at all. Finally, marine animals occupy an area and medium entirely different from that held by terrestrial animals. These variations must be borne in mind in attempting to reduce to scheme and system the vastly diverse phenomena of zoögeography.

FAUNAL REGIONS. Heretofore we have been considering only the dispersion and restriction of a species. But as a rule several kindred coexist in any given area, and these usually differ in their range, while occasionally a species of the same genus is to be found somewhere else, entirely disconnected from its fellows. This shows that the geographical area covered by a genus is greater than that of a species; and, carrying the same inquiry further, it appears true of families, orders, and classes. The larger the group in the scheme of classification the wider its geographical area. To ascertain and record the spread, past and present, of the groups of animals is the business of zoögeography. The earlier students drew up a map in which they confidently set apart a series of realms, provinces, and subprovinces. A vast amount of such information had been tabulated by Sclater, Darwin, Schmarda, Murray, and others previously to the publication, in 1876, of Alfred Russel Wallace's monumental work on the subject. Wallace, following Sclater (1857), divided the globe into six grand 'regions,' each characterized by groups of animals absent from, or very scantily represented in, any other. These were:

Palearctic Region.—Europe, Africa north of the Sahara, and Asia north of the Himalayas.

Oriental Region.—India, Malaya, southern China, Sumatra, Java, Borneo, the Philippines, and included islands.

Australian Region.—Australia and the islands north of it from Celebes eastward, New Zealand and the South Sea archipelagoes. This was divided from the Oriental region by Wallace's line—a name gracefully given by Huxley in 1868 to the zoögeographical demarcation discovered by A. R. Wallace (*Ibis*, London, 1859; *Proceedings Zoölogical Society*, London, 1863; *Malay Archipelago*, London and New York, 1869), which passes along the narrow straits between the Philippine and Sulu islands, and southward between Celebes and Borneo, Lombok and Java. He found the birds and mammals strikingly different on opposite sides of this line of deep channels. "The great contrast between the two divisions of the archipelago," he informs us, "is nowhere so abruptly exhibited as in passing from the island of Bali to that of Lombok, where the two regions are in closest proximity. . . . The strait is here 15 miles wide, so that we may pass in two hours from one great division of the earth to another, differing as essentially in their animal life as Europe does from America. If we travel from Java or Borneo to Celebes or the Moluccas, the difference is still more striking. In the first the forests abound in monkeys of many kinds, wild-cats, deer, civets, and otters, and numerous varieties of squirrels are constantly met with. In the latter none of these occur, but the prehensile-tailed cuscus is almost the only terrestrial mammal seen. . . . The birds, which are most abundant in the western islands, are woodpeckers, barbets, trogons, fruit-thrushes, and leaf-thrushes; they are seen daily and form the great ornithological feature of the country. In the eastern islands these are absolutely unknown, honeysuckers and small lories being the most common birds; so that the naturalist feels himself in a new world."

Paleotropical (or *Ethiopian*) *Region.*—Africa south of the Sahara, and Madagascar.

Nearctic Region.—North America and the elevated central region of Mexico.

Neotropical Region.—South America, Central America, and the West Indies.

Each of these regions was divided into four subregions or 'provinces.' In Africa, Cape Colony and the southeast coast formed a province, the Congo and Niger basins together another, Madagascar and the Mascarene Islands a third, and all the rest of the continent south of the Sahara a fourth. In North America, all Canada north of Lake Huron and the Saskatchewan was one province, the eastern United States as far as the central dry plains formed a second, the Rocky Mountain country and 'great basin' a third, and the Pacific Coast the fourth. And so on. For the faunal characteristics of each of these regions, see the articles under their names; also HOLARCTIC REGION; NEOGÆA; NOTOGÆA.

ARCTOGÆA AND NOTOGÆA. The apportionment above sketched has proved too artificial. The propriety of separating North America from Europe and Asia was soon disputed, and they were united by various authorities in a single circumpolar region called Holarctic (or Periarctic). The equatorial countries, mostly separated by oceans, cannot be so easily combined, and for some time the only serious change in the classic arrangement was the erection of the New Zealand group from secondary to primary rank. Much is to be said in favor of this movement, but it seems not to be generally acceptable.

As knowledge of both the living and fossil animals of the southern continents and islands has increased, and criteria have become largely available outside of the groups of birds and mammals upon which earlier conclusions were mainly based, it becomes more and more apparent that even these regional distinctions are vague. The best opinion at the opening of the twentieth century, following Huxley (1868), held that only two prime regions might be recognized in zoögeography—*Arctogæa*, a northern world, and *Notogæa*, a southern world. These names, however, are not precisely descriptive. Arctogæa includes not only the whole Northern Hemisphere, but also Paleotropica (Africa, India, and the East Indies as far as Wallace's line). Notogæa is formed of South and Central America and Australasia. Within these primary realms the old subdivisions seem to hold pretty well, except that North America does not seem separable from Eurasia, both now forming the single Holarctic Region (q.v.) of recent students.

Lesser subdivisions must be determined independently, if at all, for each group under study. Nor have even the largest zoögeographical divisions hard and fast boundaries. They overlap and blend, forming transitional zones or debatable grounds. The stretch of mountainous deserts from the western Sahara to Manchuria is such a zone, where representatives of northern and southern faunas mingle, and where dwell many species not known elsewhere in either. The so-called 'Sonoran' subregion (southwest United States to the highlands of Central America) is another borderland of debatable validity. The distinction between the Malayan and Australian subregions insisted upon by Wallace disappears entirely in respect to frogs and toads. In truth, the lesser subdivisions that have been so numerously and exactly marked off by specialists have no real existence. "They depend," to use Gadow's words (1902), "upon the class, or even order, of animals which we may happen to study. The faunistic distribution of the Urodela is not that of the Anura, and both follow separate lines of dispersal, different from those of the various orders of reptiles, birds, and mammals. This must be so. There is no doubt that the distribution of land and water was totally different in the Coal Age from what it is now. The face of the globe at the Jurassic Age can scarcely be compared with the aspect which the world had assumed in the Miocene Period. This leads to another consideration often neglected. We know that the various classes, orders, families, etc., of animals have appeared successively on the stage. A group which arose in the Coal Age followed lines of dispersal different from one which was not evolved until Jurassic times, the post-Cretaceous creatures could not avail themselves of what assisted their ancestors, and vice versa. . . . Speaking generally, the older a group the more likely it is to be widely distributed. If it appears scattered, this may be due to extinction in intermediate countries, or to submergence of former land connexions. . . . It is the morphologist who is ultimately responsible for the establishment of faunistic regions, not the systematist, least of all he who accepts an elaborate classification, and then mechanically, mathematically, by lists of genera and species, maps out the world."

Bibliography. L. K. Schmarda, *Die geographische Verbreitung der Thiere* (Vienna, 1853); P. L. Sclater, *Proceedings Linnæan Society* (*Zoology*), vol. ii. (London, 1857); id., *The Ibis* (London, 1891); A. Murray, *Geographical Distribution of Animals* (London, 1866); Thos. Huxley, *Proceedings Zoölogical Society of London*, for 1868; A. R. Wallace, *The Geographical Distribution of Animals* (New York, 1876); A. Heilprin, *The Geographical and Geological Distribution of Animals* (New York, 1887); H. Gadow, chapter on "Geographical Distribution," in Bronn's *Thierreich* (Berlin, 1893); A. Newton, *Dictionary of Birds* (London, 1893-96); F. E. Beddard, *A Text-book of Zoögeography* (Cambridge, 1895); R. Lydekker, *Geographical History of Mammals* (Cambridge, 1896); W. L. and P. L. Sclater, *The Geography of Mammals* (London, 1899). For North America, consult especially Heilprin and Newton, and the following: S. F. Baird, "Distribution and Migration of North American Birds," in *American Journal Sciences and Arts*, series 2, vol. xli. (New Haven, 1866); J. A. Allen, "Bird Faunæ of Eastern North America," in *Bulletin Museum of Comparative Zoölogy*, vol. ii. (Cambridge, Mass., 1871); Allen, "Geographical Distribution of the Mammalia," in *Bulletin United States Geological Survey* (vol. iv., No. 2, Washington, 1878); Merriam, *Proceedings Biological Society of Washington*, vol. vii. (Washington, 1892); "Biological Survey of the San Francisco Mountain Region," in *North American Fauna*, No. 3 (Department of Agriculture, Washington, 1890); and Ortmann, *Marine Tiergeographie* (Jena, 1896).

DISTRIBUTION OF DISEASES. It is generally known that local conditions, such as climate, variation of temperature, the composition of the soil, elevation of the land above the sea-level, distribution of water, and the character of the vegetation, combine with the peculiar habits of the people to determine the greater or less prevalence of certain diseases in the different regions of the earth. The science of nosography in this aspect did not receive much attention before the beginning of the nineteenth century, and is still comparatively undeveloped. The importance of climate as a factor in the distribution of diseases is obvious. Yet certain diseases, as Egyptian ophthalmia, the pellagra of Lombardy, the beri-beri of Ceylon and the Malabar coast, and the elephantiasis of the Indian peninsula, appear to have no relation to climate, but are confined to certain well-defined districts. Tropical regions are the home of malarial fevers, cholera, and hepatic diseases. This is due in part to the damp soil and decaying vegetation, particularly in the river valleys. The yellow fever of the Mexican Gulf, though often aggravated by other conditions, doubtless originated primarily from this cause. In the more temperate zones, typhus, typhoid, intermittent, and scarlet fevers are found. They are, however, for the most part, not so much endemic as epidemic. In the Northern Hemisphere, north of the tropical zone, catarrhal diseases prevail, while in the corresponding zone of the Southern Hemisphere they are unknown. Intestinal catarrh prevails, however, to a considerable extent in some parts of the intertropical regions. In some cases, hilly regions are ravaged by fevers, while in the intervening valleys fevers seldom occur. The cultivation of the soil sometimes essentially modifies the character of the malarial diseases. The destruction of forests often results in the introduction of diseases unknown before. Indeed, as a general rule, living vegetation tends to preserve health, while decaying vegetation is a prolific source of disease. Defective drainage, natural or artificial, is also a common source of disease, especially in cities. The personal habits of races and communities in respect to diet and cleanliness, exert a wide influence upon the public health. Europe, on the whole, possesses the requisite conditions of health in greater perfection than any other quarter of the world. The rates of mortality from diseases of the lungs are greater in northern than in southern latitudes. This is illustrated by the prevalence of consumption in the northeastern portion of the United States. Fevers are more prevalent in the Southern than in the Northern States. Malarial fevers are especially fatal in the southern regions of the country; they are infrequent, however, where pine forests abound.

Consult: Annesley, *Researches into the Causes of Diseases in India* (London, 1855); Martin, *Influence of Tropical Climates on European Constitutions* (London, 1877); Manson, *Tropical*

Diseases (London, 1903); Twining, *Clinical Illustrations of the More Important Diseases of Bengal and Calcutta* (London, 1832-35); Morehead, *Researches on the Diseases of India* (London, 1856). The older literature of medical geography includes the excellent works of Muhry and Boudet. Incidental illustrations of distribution may be found under DYSENTERY; ENDEMIC; GOITRE; LEPROSY; MALARIA; PLAGUE; and in the articles on fevers.

DISTRIBUTION OF PLANTS, PHYTOGEOGRAPHY, PLANT GEOGRAPHY, or GEOGRAPHICAL BOTANY. That division of biological geography that deals with the distribution and with the causes of distribution of plants. The subject has been studied since the time of Linnæus, but its modern period dates from the works of Alphonse De Candolle and of Grisebach, about the middle of the nineteenth century. More recently, the works of Warming, Drude, Engler, and Schimper have added much to our knowledge of the subject. Phytogeography may be divided into two main heads: First, ecological phytogeography, which seeks to account for the distribution of *plant-forms* (e. g. the forms peculiar to water-plants, to desert-plants, etc.) and the causes, mainly climatic and meteorological, of such distribution; second, floristic phytogeography, which has for its aim the subdivision of the world into floral regions and districts, and the study of the distribution of *plant-species* in these regions, thus dealing with the species as units, and seeking to determine the geological and similar causes for plant distribution.

ECOLOGICAL PHYTOGEOGRAPHY.

Schimper subdivides the world into tropical, temperate, and frigid regions, alpine districts, and the seas. Each of these divisions, especially the first two, is in turn redivided into formations. These formations, if determined by climatic factors, are termed climatic formations, if by local or soil factors, edaphic formations. For example, deserts and tropical rainy forests are climatic formations, their existence being determined mainly by the distribution of atmospheric moisture; on the other hand, the flora of a swamp or of a heath, being governed mainly by local soil factors, is spoken of as an edaphic formation.

CLIMATIC FORMATIONS. In general, the climatic plant-formations of the world belong to one of three types; viz. forests, grass-lands, or deserts. This classification points to three great atmospheric factors—wind, moisture, temperature. Wind has acted as the great distributing agent, carrying seeds and spores from place to place. Moisture is not only necessary to the germination of seeds and the growth of plants, but its abundance or scarcity has a profound influence upon plant-growth; the moist belt bordering the equator is as remarkable for the luxuriance of its vegetation as the arid districts—the great deserts of the world—under the Tropic of Cancer, are noted for their barrenness; barrenness proved, by oases at springs and by the results of irrigation, to be due mainly, if not solely, to the absence of water. The range of temperature in which plants will grow and reproduce varies widely with different species; some are capable of withstanding very low temperature, others very high, and in many instances experiment has proved that members of either group will fail under conditions favorable to members of the other. A fourth factor, light, must be considered. Light is as essential to the growth of green plants as are moisture and heat, but the amount necessary for individual species varies greatly. Some are able to thrive in even the dense shade of tropical forests; others are unable to exist except in direct sunlight. Again, the effect of the amount of light is well illustrated by the shortening of the period of growth required by cereals cultivated in the Canadian Northwest, due to the extra hours of sunshine during the growing season. Although, as yet, but little knowledge has been gained by experiment to aid in determining the exact nature of the influence of these factors on the distribution of plants, there is no room for doubt that such influences do operate. Between the equator and the poles, between the base and the top of a mountain, between the moist coastal districts and the arid interiors of the continents, between the depths of a forest and the treeless plateau, there are gradual changes in the vegetation that mark the striking parallelism that exists between the distribution of wind, moisture, heat, and light, and the distribution of plants.

EDAPHIC FORMATIONS. As already noted, the edaphic formations are determined by local causes, mainly those which reside in the soil. Much dispute has arisen among authors as to whether chemical or physical causes are uppermost in determining distribution; dispute that obviously cannot be settled until knowledge based upon sufficient experimental data, at present sadly lacking in most instances, shall be gained upon this subject. It seems most in harmony with our present knowledge to hold with Warming that the water in the soil is the most potent factor in determining local distribution of forms. In passing from the centre of a pond to upland, plants may be encountered in more or less definite succession whose structures bear close relations to the water-supply. Forms, such as duckweed, which have no root-anchorage, but drift with the wind on the surface of the water, have large air-containing chambers, which greatly increase the transpiring surface. A similar open structure is observed in water plants whose roots are anchored on the bottom and in those marsh plants growing on the margins, but as the ground becomes more and more dry the open structure which favors transpiration gradually disappears, and devices for checking transpiration take their place. Careful study has shown clearly that there are other elements, however, which must be considered. For example, the vegetation of an undrained swamp is radically different from that of a similar moist situation on a river margin. Doubtless, certain conditions of drainage enter here to cause the difference in plant forms. Again, factors which are in a certain sense atmospheric often have a local influence. Plant forms found on the north side of a hill frequently differ from those on the south side because of possible differences in exposure to moisture and wind as well as to different exposure to the sun. All of these factors may, so to speak, be regarded as edaphic, since all are similar in being local rather than climatic. In general, the edaphic formations may be subdivided into *coastal formations* or societies, and *inland formations* or societies. The coastal societies may be destructive, as illustrated by the erosion of cliffs where they break down the rocks; or they may be constructive, as illustrated by swamps and beaches, where they act in building up the land. Inland societies may be divided into those associated with river activities and those that are not. In the life of a region all areas will ultimately be worked over by rivers, so that the stages which are not associated with rivers may be regarded as more or less temporal. The ultimate condition of a region is that of the base-level (the flat lowland resulting from completed erosion) toward which the other conditions are approaching, and which in a favorable climate will be covered in most instances by a mesophytic forest.

FLORISTIC PHYTOGEOGRAPHY.

In a general presentation of the distribution of plants, the algæ, fungi, liverworts, and mosses may be dismissed with a few statements. These groups are found everywhere. It should be noted, however, that the brown algæ (kelps) reach their greatest development in the colder waters; and that the lichens and mosses are more abundantly displayed in temperate and arctic than in tropical regions.

PTERIDOPHYTES. In number the ferns so far exceed all other pteridophytes that they may be taken as representing the group. Their greatest display is in the tropics, where they often assume the tree form and develop extraordinarily large fronds. In temperate regions they are neither abundant nor conspicuous; while in arctic and alpine conditions they are hardly at all represented. It will be noted that the distribution of ferns is almost in direct contrast to that of mosses.

GYMNOSPERMS. In presenting the distribution of gymnosperms, the three principal living groups must be considered separately. The *cycads* are strictly tropical forms, being distributed about equally between the Oriental and Occidental tropics, the genera for the most part being definitely restricted to certain regions. For example, while the genus Cycas ranges throughout the Oriental tropics, and Zamia throughout the Occidental tropics, one genus is strictly Australasian, two are African, two Mexican, and one is Cuban. The conifers form the largest group of gymnosperms, and their distribution contrasts sharply with that of the cycads, being entirely absent from the tropics and massed in the temperate regions, especially of the Northern Hemisphere. The broad tropical belt separating the conifers of the north and the south temperate regions is traversed in only two places, namely by a southern genus, Podocarpus, that reaches China and Japan through the East Indies, and by a northern genus, Libocedrus, that reaches into temperate South America by way of the Andes. By far the greatest conifer display, with respect to number of genera and of species, is found in the districts that border the Pacific Ocean, the chief areas being the China-Japan region, the Australasian region, and western North America. The most remarkable displays of endemic genera are in the China-Japan and the Australasian regions, the former containing eight such genera, and the latter five. The other regions of endemic genera are North America, with its redwood (Sequoia), and bald cypress (Taxodium), and South America, with a peculiar genus in the mountains of Patagonia. Throughout the north temperate regions the dominant and widely distributed genera are the pine (Pinus), juniper (Juniperus), fir (Abies), spruce (Picea), cypress (Cupressus), and larch (Larix); the order of citation indicating their relative abundance. There is also a remarkable pairing of western North America and eastern Asia in the display of certain genera, no less than six genera being common to these two regions and occurring nowhere else. The distribution of the conifers of the Southern Hemisphere is modified by the temperate conditions that occur in three great isolated areas. The dominant genus, Podocarpus, the 'pine' of the Southern Hemisphere, is the only one represented in all of these regions; but in the display of certain other genera there is a pairing of the continents, the Australasian region always being one member of the pair, and, with one exception, South America the other member. In conifers, therefore, there is much more in common between Australia and South America than between either of them and Africa. The Gnetales, constituting the third prominent group of gymnosperms, embrace three genera of very distinct characters and distribution. Ephedra occurs under both tropical and temperate conditions in the arid regions of Mediterranean Europe and adjacent Asia, and in arid parts of America; Gnetum ranges through the moist tropics of both hemispheres; while the monotypic Tumboa (Welwitschia) is narrowly restricted to certain extremely arid regions of Western Africa.

ANGIOSPERMS. The immense number of angiosperms, or true flowering plants, makes their distribution a difficult subject to present in a few statements. It must be understood, therefore, that the following presentation is very general, considering large masses of plants rather than species or even genera. It must be remembered, also, that in general the conditions of plant life are most favorable in the tropics, where there is apt to be massing; and that under Arctic conditions, which are very unfavorable, the vegetation is apt to be scant. The three prominent groups of angiosperms, viz. the monocotyledons and the two divisions of dicotyledons (Archichlamydeæ and Sympetalæ) must be considered separately.

MONOCOTYLEDONS. The most conspicuous general facts in connection with the distribution of monocotyledons are as follows: *Cosmopolitan groups.*—Four great families (grass, sedge, lily, and iris), including almost 10,000 species or about one-half of the monocotyledons, are world-wide in their distribution. This means that they have succeeded in adapting themselves to every condition of soil and climate possible to flowering plants; and in this feature the grasses easily lead not only monocotyledons, but all other seed-bearing plants. Beyond the natural massing toward the tropics, the distribution of these four families is fairly uniform. *Aquatic plants.*—The monocotyledons include an unusual number of purely aquatic families, although among the other families the number of water-species is remarkable. A distinct water habit is associated with world-wide distribution, not merely of families, but often of species. For example, the common cat-tail rush (*Typha*) of the United States is also found in Europe, Asia, and Africa. But it must be noted that although these aquatic families of monocotyledons are world-wide in their distribution, their number of species is remarkably small, being about 180. In contrasting this with the 10,000 species of the four terrestrial families above referred to, it becomes evident that the relatively uniform conditions of aquatic life do not result in the evolution of species as do the extremely varied conditions of terrestrial life. *Tropical Plants.*—The remarkable massing of monocotyledonous families in the tropics, far in excess of any normal ratio of tropical increase, makes it evident that the monocotyledons as a whole must be considered the leading tropical group of angiosperms. This tropical massing is indicated by the fact that, excluding the ten families of world-wide distribution, twenty-three out of the thirty-three remaining families are tropical. It is even more strongly indicated by the fact that, excluding the 10,000 species that were noted above as belonging to the four world-wide families, all but a few hundred of the remaining 10,000 are tropical. The approximately equal distribution of tropical forms between the two hemispheres is noteworthy. This is true not merely in the number of families, but in genera and species as well. There are four or five families peculiar to the Orient, seven or eight peculiar to the Occident, and perhaps ten or eleven common to both. The palms may be taken as an illustration of the distribution of tropical monocotyledons. There are approximately a thousand species of palms, almost exactly divided between the two hemispheres, but not a single native species is common to the two. The genera are about 130, approximately, 75 of them being Oriental and 55 Occidental, the apparent inequality being accounted for by the more numerous monotypic genera in the Orient, due to the larger and more broken tropical area, but the two hemispheres have not a genus in common. The family is divided into great tribes, but not one of these tribes is common to the two hemispheres. These tribes are groups of genera on the way to becoming families, and by some are regarded as such already. The palms thus notably illustrate the effect of long separation in plant adaptation to continental diversities, temperate and arctic conditions long having cut off the connecting land between the tropical regions of the two hemispheres, which are believed to have been united in prehistoric times and between which plant and animal forms could migrate. The preponderance of epiphytic forms in the Occidental tropics is probably associated with the great development there of the rainy tropical forest. The two great epiphytic groups of flowering plants are bromelias and orchids, both monocotyledons, the former family being restricted to the Occidental tropics, and the latter much more abundant there than in the Orient. The general adaptation of the monocotyledons to tropical conditions is emphasized by the extreme dearth of monocotyledonous species in arctic and alpine regions, only the few species belonging to the four families of universal distribution being present. The feeble representation of monocotyledons in the Southern Hemisphere outside of the tropics is noteworthy. There are only four small families belonging exclusively to this region; and in Australia, a continent prolific of endemic forms among gymnosperms and dicotyledons, there is but a single endemic family of monocotyledons, containing only four species. A family of most peculiar distribution is the Stemonaceæ, comprising only seven or eight species, but serving to illustrate how a family once widely distributed may later occur only in widely separated areas. One genus, *Stemona*, occurs from the Himalayas to southern Australia; another, *Croomia*, in Florida, Georgia, and Japan; and the third, *Stichneuron*, in the East Indies.

DICOTYLEDONS. There are approximately 80,000 species of dicotyledons, about equally divided between the two great groups *Archichlamydeæ* and *Sympetalæ*. These must be considered separately, since they have developed independently and are quite distinct in the general features of the geographical distribution.

ARCHICHLAMYDEÆ. The most conspicuous facts in connection with the distribution of the Archichlamydeæ are as follows: In the representation of tropical families, there is a notable pairing of continents, the American tropics usually being one member of the pair, and Asia or Africa the other. For example, the great alliance to which buttercups, mustards, poppies, laurels, etc., belong is represented by tropical forms chiefly in America and Asia, the omission of Africa being notable; the alliance to which geraniums, balsams, flaxes, rues, etc., belong has its tropical forms chiefly in America and Africa; while the melastomas are massed in Brazil, and the myrtles are common to South America and Australia. Thus the predominance of America appears in the display of tropical Archichlamydeæ. This becomes all the more clear from the statement that in America almost all the tropical and subtropical families are represented, and two very large families, the cactus and melastoma families, are found as natives exclusively in America. The Archichlamydeæ are also peculiar in not containing any terrestrial family of world-wide distribution, as do the monocotyledons and Sympetalæ; nor is there any distinctly boreal family as among the Sympetalæ. There have been developed among them certain very characteristic north temperate families, the smartweeds, pinks, crowfoots, mustards, saxifrages, roses, evening primroses, and umbellifers, all of which, however, have their representatives in tropical and boreal regions; but the display of these forms is not to be compared with the massing of the Sympetalæ in the temperate regions. While there is a much larger display of Archichlamydeæ in the north temperate than in the south temperate regions, two very large and characteristic families have been developed in the Southern Hemisphere, viz. the Proteaceæ, trees that belong to the same general alliance as do the oaks, elms, hickories, etc., of the Northern Hemisphere; and the Thymelæaceæ, characteristic of Australia and the Cape region of Africa, and represented in our American flora by the leatherwood (*Dirca*). The Archichlamydeæ contain most of the hard-wood trees, and it is interesting to note that the trees of the tropics and the temperate zones belong to different alliances. For example, the oaks, hickories, elms, beeches, birches, etc., belong to a great alliance characteristic of north temperate regions, while the laurel, belonging to an entirely different alliance, is the characteristic forest type of the tropics. By far the greatest family of the Archichlamydeæ, in point of numbers and general success, is the pea family (Leguminosæ), represented by about 7000 species. Although it seems to be abundantly displayed in the temperate regions, it is far more extensively represented in the tropics, being the greatest tropical family of the group. The lianas or climbers are chiefly represented among Archichlamydeæ by such forms as the grape-vines and their allies. Naturally, they are chiefly displayed in tropical forests and are most largely developed in the moist forests of South America, as are the epiphytic orchids and bromelias among the monocotyledons. Their next largest display is in Africa.

SYMPETALÆ. The Sympetalæ are the ranking plants of the plant kingdom and are also those most recently evolved. While they include a number of shrubs and trees in the tropics, they are by no means so extensively represented in temperate regions by shrubs and trees as are the Archichlamydeæ. The prominent facts of their distribution are as follows: the earlier groups of angiosperms (Archichlamydeæ and monocotyledons) were massed in the tropics, the temperate and boreal regions being relatively poor in true flowering plants. The Sympetalæ, therefore, while largely represented in the tropics, found the temperate and boreal regions comparatively free for occupation, and it is in these regions that they have become peculiarly dominant. This does not mean that there are not more Sympetalæ in the tropics than in the temperate regions, for the proportion of species in favor of the former is about three to two; but it does mean that this is about the normal ratio of tropical increase, which is far exceeded by the other groups. Accordingly, of the Sympetalæ alone can it be said that their distribution throughout tropical and temperate regions is about uniform. The families of Sympetalæ are not only better defined structurally than those of the Archichlamydeæ, but their geographical distribution is much more definite. This follows the fact that they are more highly specialized and more definitely related to environment than are the Archichlamydeæ. Among the Sympetalæ, three families, the plantains, mints, and composites, have a world-wide distribution. The Compositæ, as the ranking family of the plant kingdom, and also the youngest and largest, deserves special mention. It includes at least 12,000 species, which, although found everywhere, are most numerous in the temperate regions, where they constitute from one-tenth to one-seventh of all of the seed-bearing plants of every flora. They are especially characteristic of temperate America, where asters, goldenrods, sunflowers, etc., abound. Two great north temperate families, the figworts and the borages, have also been developed; and the heaths form a family characteristic of boreal conditions.

The impress a peculiar region may have upon the general aspect of its vegetation, resulting in the assumption of the same general appearance by plants of the most diverse relationships, is illustrated by the fact that many sympetalous families of South America are characterized by a heath-like habit, the region being known as one of the heath-like plants. There is no such notable continental pairing as is shown by the Archichlamydeæ and the monocotyledons, due probably to the fact that extensive forests and boreal distribution permit free intermingling of continental flora. Among tropical Sympetalæ, however, the pairing is somewhat evident, and in tropical display America is distinctly dominant. It is also worthy of note that there is a remarkable paucity of aquatic plants among Sympetalæ, as compared with Archichlamydeæ and with monocotyledons. This seems to be related to the fact that the two latter groups had already become well established in fresh and brackish waters, while it was the temperate and boreal land surface that was especially free for occupation by the Sympetalæ.

CONCLUSION. Through the lapse of time since the advent of plant life upon the earth, the meteorological factors, wind, moisture, heat, and light, have been at work as plant distributors. At divers times and in many parts of the world their work has been interrupted, assisted, or rendered nugatory by geological agents—glaciers, especially of the ice age, which have driven vegetation before them and exiled many plants from their pristine homes; seismic upheavals or sinkings, the former interposing tall mountain ranges, the latter wide oceans, beyond which certain species could not migrate, and which to a greater or less degree isolated these species, sometimes genera, families, and even tribes. The efforts of these factors and agents have been and are assisted by man, by other animals, and by plants; the first either wittingly carrying useful or ornamental species from country to country, or more often unwittingly introducing useless or even noxious ones; the second in a more limited range transporting seed either in or on their bodies; the third breaking down and disintegrating rock, becoming incorporated with the detritus and thus affording a habitation to a succeeding plant society. Far from having ceased their labors, these meteorological factors and geological agents, working in conjunction or in conflict, still profoundly influence the ceaseless change in the distribution of plants.

BIBLIOGRAPHY. Contejean: *Géographie botanique* (Paris, 1881); Drude, *Handbuch der Pflanzengeographie* (Stuttgart, 1890); id., *Manuel de géographie botanique* (Paris, 1897); De Candolle, *Géographie botanique raisonnée* (Paris, 1855); Engler, *Versuch einer Entwicklungsgeschichte der extratropischen Florengebiete* (Leipzig, 1879); Engler and Drude, *Die Vegetation der Erde* (first 4 vols., Leipzig, 1896-1901); Grisebach, *Vegetation der Erde* (Leipzig, 1884); Schimper, *Pflanzengeographie auf physiologischer Grundlage* (Jena, 1898); Wallace, *Island Life* (New York, 1895); Warming, *Oekologische Pflanzengeographie* (Berlin, 1896). The ecological aspects of distribution are touched upon under the following heads: ECOLOGY; ALPINE PLANTS; ARCTIC PLANTS; BENTHOS; CLAY PLANTS; CLIFF PLANTS; COSMOPOLITES; DESERT; DUNE VEGETATION; DURATION; ENDEMISM; FOREST; GRASSLANDS; HALOPHYTES; HEATH; HYDROPHYTES; MEADOW; MESOPHYTES; PRAIRIE; ROCK PLANTS; RUDERAL PLANTS; SAVANNAS; SWAMP; THICKET; TUNDRA; XEROPHYTES. Details of floristic phytogeography may be found in the articles on various genera and species of plants mentioned above.

DISTRIBUTIVE LAW. In its elementary form this mathematical law may be expressed thus: To multiply any compound expression by a simple expression is to multiply each term of the compound expression by the multiplier and write the separate products in order, affecting each product with its proper sign. Symbolically:

$$\pm a(\pm b \pm c \pm d \ldots\ldots) = \pm ab \pm ac \pm ad \pm \ldots\ldots$$

$a, b, c, \ldots\ldots$ being any algebraic quantities. See CALCULUS.

DISTRICT (ML. *districtus*, territory wherein a lord may distrain, from Lat. *distringere*, to pull asunder). A political subdivision of a city, county, or State, which forms the basis of legislative representation. Its boundaries are fixed by law, either by the enactment of the legislature or by the adjudication of a court, to whom this power is delegated. The citizens thereof assemble within these boundaries and vote for local, State and National officials. In the United States the boundaries of the Congressional district in each State are determined by the State Legislature after the apportionment of representation has been made by Congress, following on every decennial census. The ratio of representation under the census of 1900 was 194,182, and the total number of Congressional districts 386. There is no definite principle laid down for the manner in which a State may be redistricted, and as a rule the party in power will, as far as possible, so distribute representation as to insure its continued supremacy. See GERRYMANDER.

For the purposes of taxation, the term has a broader meaning, and the Supreme Court of the United States has decided that for the collection of taxes a district means any part of a State described for the purpose of assessment, without reference to the civil or political divisions of the State, made for election purposes. See Kelly *vs.* Sanders, 99 *United States Reports*, p. 441.

DISTRICT ATTORNEY. In the United States, the public prosecuting officer within a defined district. The Federal Government has one set of district attorneys, and each State has an entirely different set for the same territory. The former are appointed by the President, and are in reality deputies of the Attorney-General of the United States, to whom they are required to make report of their official acts, and to whose direction and control they are subject. They are appointed for the several districts into which the United States are divided for district courts (see article on COURT, subdivision *United States Courts*), and are charged with prosecuting offenses against the Federal Government, as well as with conducting civil actions on behalf of the Government, and in some cases on behalf of Government officers. As a rule their compensation comes from fees, and is not in the form of a stated salary.

In most of the States a State district attorney is elected in each county, although his most important duties, as a rule, are discharged in prosecuting criminals before the State courts. He is also the prosecuting officer before the county court of the county in which he is elected. He is subject at times to the control of the Attorney-General of the State, and in New York is removable by the Governor. In certain contingencies he may call upon the State Attorney-General for assistance in important criminal prosecutions. His duties and powers are regulated under the provisions of the statutes in accordance with which he is appointed or elected. For these consult the Federal and State statutes.

DISTRICT COURT. A court having a jurisdiction limited to a defined judicial district. Several of the United States have divided their territory into judicial districts, but the court of the district is usually a branch or 'term' of the highest court of original jurisdiction of the State and not a separate tribunal.

THE DISTRICT COURTS OF THE UNITED STATES, however, are district tribunals subordinate to the circuit courts. Criminal bankruptcy and admiralty causes are important branches of their jurisdiction. Each of the nine judicial circuits (corresponding to the number of justices of the Supreme Court) is divided into a larger or smaller number of districts. In some instances a district embraces the whole territory of a State; in others, States are divided into two or more districts. In four instances a single judge serves two districts. With these exceptions, there is one judge for each district. In the Southern District of New York there are three judges, and five districts have two judges each. See COURT, subdivision *United States Courts*.

DISTRICT OF COLUMBIA. A territory embracing 60 square miles, situated on the east bank of the Potomac River, between Maryland and Virginia (Map: Maryland, B 7). The surface is flat and marshy along the Potomac, but elsewhere gently rolling and hilly. The Anacostia River, or Eastern Branch (of the Potomac), crosses the southern portion, and Rock Creek, a stream abounding in picturesque scenery, traverses the northwestern part. The climate (mean temperature 55°) is subject to sudden and extreme variations of temperature. The rainfall is about 50 inches annually. Snow falls in the winter, but is generally of short duration. The soil is a light sandy loam. Twenty-two per cent. of the area, or 8500 acres, is contained in farms. The nature of the agricultural industries is determined by the proximity to Washington, and the products are chiefly those of the vegetable garden and the dairy. The largest acreage therefore consists of hay and pasture lands and gardens. Floriculture is of considerable importance, the annual returns from this source exceeding half a million dollars.

POPULATION. The population in 1800 (when the area was one-half larger than at present) numbered 14,100; in 1850, 51,687; in 1860, 75,000; in 1870, 131,700; in 1890, 230,400; in 1900, 278,700; in 1905 (est.), 302,883. There was in 1900 a very small foreign-born population (19,500), but the negro element is large (86,700). The mass of the population is centred in the city of Washington. The villages surrounding it bear the relation of suburbs to the city proper.

GOVERNMENT. The District of Columbia was governed directly by Congress until 1871, when it was placed under a regular Territorial government. A Governor and Secretary were appointed, a delegate was chosen to represent the Territory in Congress, while a legislature of 11 councilmen and 22 delegates was elected by the people annually. In 1874 the government was placed under the control of three commissioners appointed by the President and approved by the Senate. The citizens have no direct voice in the appointments to office within the District, having no vote in District or National affairs.

HISTORY. Originally the District of Columbia comprised land on both sides of the Potomac—

land ceded by the States concerned on the condition that Congress or the United States should exercise exclusive control over it forever. Maryland ceded 64 square miles (including water), the whole of Washington County, and Virginia ceded 36 square miles, Alexandria County. In 1846, as no Government buildings had been erected on the Virginia side, Alexandria County was retroceded. Within the present District, probably on the site of Anacostia, stood the famous Indian village of Powhattan, Nacochtank, or Anacostan, which Captain Smith visited in 1608. In 1663 Francis Pope, an Englishman, established a plantation where Washington was afterwards built. To the site of Georgetown settlers came probably as early as 1665, and in 1751 a town was laid out here, which in 1789 was regularly incorporated. Immediately after the close of the Revolution there was much discussion about the location of the permanent seat of government, and, after the adoption of the Constitution in 1789, this question gave rise to the first debate which aroused bitter sectional feeling. Finally, on June 28, 1790, after the claims of New York, Philadelphia, Germantown, Baltimore, and several other places had been fully considered, Congress decided that after 1800 the Federal capital should be moved to "a district or territory not exceeding 10 miles square on the River Potomac between the mouth of the Eastern Branch and Conogocheague." This decision was reached partly as the result of a compromise and partly in deference to the known wishes of Washington. See WASHINGTON.

DISTRINGAS. The name of a writ or process in the nature of an attachment or execution, taken from the emphatic word of the writ directed to the sheriff—viz. "It is hereby commanded *that you distrain*" the defendant, etc. It was formerly issued in England for a variety of purposes, such as forcing a defendant who neglected to appear to present himself in court, or forcing a corporation to obey a subpœna, or compelling jurors to attend court, or a defendant in an action in detinue after judgment to deliver the goods to the plaintiff. The writ has been abolished in England, as well as in most of the United States, although in Virginia it is retained as a form of execution in cases of detinue. See EXECUTION.

DISTURBANCE. The common-law offense of violating an incorporeal property right, as an easement, a profit, or a public right in the land of another. As such rights do not carry with them the right of possession, but, as the technical expression is, 'lie in grant,' and not 'in livery,' they cannot usually be protected by the action of trespass, which contemplates an interference with the possession of a corporeal interest in land. But such rights, however impalpable, do really constitute property, and they will be protected by appropriate legal proceedings against a disturbance by the owner of the land or by any other person whatsoever. In a few cases, as where one has an exclusive right to the use of another's land as a sole and several pasturage—such right being nearly equivalent to the right of possession of the premises—the action of trespass is available for its protection. In other cases the disturbance constitutes a nuisance, which may be abated either by the act of the party injured thereby, or by the action known as 'trespass on the case,' or, more shortly, 'case'; or, in a proper case, by an injunction in equity.

The forms of disturbance are various, depending upon the nature of the right involved. Thus a common of pasture may be disturbed by shutting or driving out the cattle of the claimant of the right, or by unlawfully permitting other cattle to crop the herbage. In the last case the claimant may take the cattle damage feasant and impound them. A franchise is disturbed by wrongfully taking the tolls accruing therefrom, or by setting up a competing use, as a bridge, ferry, or turnpike. For interference with an advowson or right of presentation to a benefice, known as disturbance of patronage, a special action was provided, known as writ of right of advowson. Disturbance of ways happens "where a person who hath a right of way over another's ground by grant or prescription is obstructed by inclosures or other obstacles, or by plowing across it, by which means he cannot enjoy his right of way, or at least in so commodious a manner as he might have done" (2 Bl. Com., 242). This is remediable by the act of the party injured, removing the obstacle, or by an action on the case.

All of these forms of disturbance of private rights, together with the remedies appropriate to them, exist to-day, as at common law, without material alteration. The ancient wrong of *disturbance of tenure*, which consisted in breaking the feudal tie of lord and tenant, has become obsolete with the disappearance of the feudal system of land tenure. The disturbance of public rights, as of a highway or a public right of common or of fishing, may be either a private nuisance, remediable by the individual whose right is interfered with, or a public nuisance, or purpresture, remediable by the State. See EASEMENT; NUISANCE; PROFIT; TRESPASS, etc.; and consult the authorities referred to under EASEMENT.

DISTURBANCE OF PUBLIC WORSHIP. A modern statutory offense, which has, in the United States, generally superseded the common-law offense of brawling in church. As generally defined, it consists in any willful interference, by acts or words, with the good order of persons assembled for religious worship, whether within a consecrated place of worship or elsewhere. The offense may be committed by a person present in the place of worship, or by noisy conduct on the outside, and to constitute such acts or conduct a disturbance, it is not necessary that the congregation assembled shall at the time be engaged in worship. It is sufficient if they are assembled for that purpose. The offense constitutes a misdemeanor, punishable by fine or imprisonment. It is not such a violation of private rights as to furnish grounds for an action for damages, unless it be habitual or so persistent as to amount to a nuisance. In that case the remedy by action lies in the hands of the trustees or other officers in whom the possession of the place of worship is vested. See NUISANCE.

DISUSE. One of the negative, but yet important, factors of evolution is disuse. Its significance was first pointed out by Lamarck in his first law of evolution, wherein he says that the constant lack of use of an organ "imperceptibly weakens it, causes it to become reduced, progressively diminishes its faculties, and ends in its disappearance." An example he gives of the reduction and loss of organs or limbs is that of snakes, which by change of habit from originally running to gliding directly along the ground, have acquired greater length of body, while their legs, being thus disadvantageous to them, have disappeared by atrophy.

He also instances the loss by disuse of teeth in the baleen whales and in birds, and in the anteater, "whose habit of not masticating its food has been for a long time established and preserved in its race." He calls attention to the small reduced fore legs of the kangaroo, which "have remained thin, very small, and weak," and especially to the whale, saying: "Indeed, since the enormous length of time during which these animals have lived in the depths of the sea, never using their hind feet in seizing objects, their disused feet have wholly disappeared, as also their skeleton, and even the pelvis serving as their attachment."

Lamarck taught that the effects of disuse are inherited, a doctrine maintained by Darwin, who remarks: "I think there can be no doubt that use in our domestic animals strengthens and enlarges certain parts, and disuse diminishes them; and that such modifications are inherited," adding that in free nature "many animals have structures which can be explained by the effects of disuse." See USE-INHERITANCE.

Darwin also calls attention to the absence in many male dung-beetles, including the Ateuchus or 'sacred' beetle of the Egyptians, of the anterior tarsi or feet, and this atrophy he thinks it safe to regard "as due to the effects of long-continued disuse." The same may be said of the reduction and loss of the fore tarsi of butterflies of the family Nymphalidæ. For cases of the loss of eyesight, of eyes, and the optic nerves and lobes in animals living in darkness, see CAVE ANIMALS.

Cases of the modification of animals by disuse occur in nearly every group. Among the mollusks it is especially noticeable in those bivalves, such as the oyster, anomia, etc., which live attached to other bodies. The oyster was originally equivalve and capable of freely moving, but by disuse, owing to change in its ancestors to a fixed mode of life, it has lost its siphons, its foot, and the shells are of unequal size. It is so with the fresh-water mussel (Mülleria) of South America, which has acquired sedentary habits. It is the case in a still more marked way with the barnacles. Among insects there are countless instances of the reduction and partial or total loss of limbs in wood-borers, in the grubs of many beetles living in seeds, nuts, etc.; in the larvæ of gall-flies, of ants, wasps, bees, and in the larvæ of the ichneumon-flies. If, as is very clearly the case with insects, we also attempt to explain the loss of limbs in the two-legged Bipes, Chirotes, or the entirely legless Amphisbæna and the glass-snake (Ophiosaurus), we shall see that it is evidently due to disuse and its inherited effects. Reasoning from this to the origin of the order of snakes, it becomes apparent that they have diverged from the lizards, and that Lamarck was right when he attributed their origin to such a cause. (See DEGENERATION.) The majority of snakes possess no trace of vestigial legs, the exception being the boas, in which there are two minute horn-like vestiges projecting from under the scales, and representing the hinder pair of limbs. Disuse has also made its mark in the running birds, the emu, ostrich, and cassowary, where the wings have by disuse retrograded, and as a compensation the legs and particularly the toes have become adapted for a cursorial mode of locomotion. Other examples of disuse are the loss of the thumb in the thumbless ring-monkey (Colobus) of Africa, and the spider-monkey (Ateles) of Central and South America.

It is to be observed in these cases of the reduction and loss of digits that it is generally complete and thorough-going; there are no vestiges left as seen in the two-toed ostrich and the three-toed moa, apteryx, emu, and cassowary. The reduction is complete, and is probably due to the high antiquity of these birds. That this is the case is suggested by the presence of the two splint-bones of the horse, while the bones of the two other toes which began to be lost at an earlier geological age have entirely lapsed. In the potto (Perodicticus), a lemur which has partly lost the index-finger, there is a distinct vestige left, the reduction having apparently taken place late in the phylogeny of this form.

In the case of the loss of wings in insects, of which there are so many cases, we have all grades of reduction. Some are completely apterous, with no vestiges of wings; in others there are little flaps left. The absence of wings in all these cases is clearly the result of change in the surroundings, or mode of life, as the wingless beetles, etc., which live under stones, or burrow in the ground.

A very interesting question here arises: Could these losses ever be restored? When we consider forms like the stick-insect, whose ancestors of the Carboniferous period had large, well-developed wings; or the flea, and the Braula, the sheep-tick (Melophagus) and the bat-tick (Nycteribia), it seems impossible that they could be restored to their ancestral winged form, even if the attempt were made to do so artificially in a laboratory of experimental evolution. Other cases are the loss outright of the collar-bone in running mammals like the horse and most carnivora, of the canines in rodents, and all the teeth in the ant-eaters. It may be considered as contrary to the course of nature to suppose that these structures, once degenerated and lost, could ever be restored. See DEGENERATION.

Here arises a question: Are there examples of the replacement by entirely new structures of organs lapsed by disuse?

The clearest case is that of the duckbill of Australia. Poulton has shown that the embryo duckbill has for a brief season the rudiments of three teeth in each upper maxilla, but that these are very soon lost, while their place is occupied by the posterior set of the eight horny plates situated in the upper and lower jaws, two upon each side of each jaw. The calcified true teeth of Ornithorhynchus became, Poulton thinks, unsuited to the needs of the animal when it adopted a mode of life in which large quantities of sand were necessarily taken into the mouth with the food, when it first fed upon insect larvæ, etc., which it dug with its broad bill out of the mud and sand at the bottom of streams. "Under such circumstances two things might happen: the true teeth might be protected from the effects of wear by continuous growth from persistent pulps or by a continued succession; or a constantly growing horny plate might be developed from the oral epithelium, and might be substituted for the true teeth." See DUCKBILL, and illustration of teeth thereunder.

A less satisfactory example is that of the replacement of the horny teeth of the tadpole by the teeth of the frog or toad. But Nature as a rule gets her new organs by a more economical and rapid method, i.e. by change of function of the same organ, which, owing to a change of habit, loses its original use, and becomes modified to carry on entirely different functions. See FUNCTION-CHANGES.

DISVELLOPED, or **DEVELOPED** (from OF. *desveloper*, to unfold). In heraldry, a term applied to the colors of a regiment or noble house, when flying.

DITCH (ME. *diche*, AS. *dīc*, dike, Icel. *dīk*, MHG. *tīch*, ditch, Ger. *Teich*, pool; connected ultimately with Gk. *τεῖχος teïchos*, wall). (1) In agriculture, a trench made along the sides of fields, or following the contour of the land, to collect and remove the excess of water. A hedge is often planted, or a fence built, upon the bank formed by the earth thrown out of the trench, the two thus furnishing a barrier for stock. Sometimes a double ditch is made and the hedge or fence is placed between. In ordinary farm operations ditches are largely constructed by hand, but efficient ditching machines are found in the market. In modern practice open ditches have been largely superseded by underground tile drains, thus effecting a great saving of land and securing better drainage. In irrigated regions the open ditch is used to convey the water from the main canals to the 'laterals' which distribute it over the field. See DRAINAGE; IRRIGATION.

(2) In military fortifications, part of the defense works of a fortified place. See FORTIFICATION; REDOUBT.

DITHMARSCHEN, dĕt′märsh-*en*, NORTH AND SOUTH (*Norder* and *Süder Dithmarschen*). The name given to the western portion of Holstein, Prussia, lying along the coast of the North Sea between the Eider and Elbe rivers. It has an area of about 500 square miles, lies very low, and is for the most part marshy. Dithmarschen was originally inhabited by Saxons, who were subjugated and Christianized by Charlemagne in 804. Subsequently a considerable Frisian element was introduced into the population. In the latter part of the Middle Ages and at the time of the Reformation Dithmarschen constituted a kind of peasant republic, with a complex organization and a well-developed system of local autonomy. The inhabitants distinguished themselves by the bravery with which they defended their liberty against their neighbors. At last in 1559 they succumbed to the arms of Holstein and Denmark. In 1866 Dithmarschen, along with the rest of Holstein, was incorporated in Prussia. The people still retain many of their ancient customs and privileges. Population, in 1895, 84,262; in 1900, 86,019. Consult: Volkmar, *Geschichte des Landes Dithmarschen* (Brunswick, 1851); Nitzsch, *Das alte Dithmarschen* (Kiel, 1862); Nehlsen, *Dithmarscher Geschichte* (Hamburg, 1894).

DITH′YRAM′BUS (Lat., from Gk. *διθύραμβος*, *dithyrambos*, of uncertain etymology). A hymn sung in honor of the god Dionysus, accompanied by music on the flute and a dance around the altar. The subject was originally the birth and life of Dionysus, but later other themes were chosen. Its development into artistic form took place at Corinth—according to another tradition at Naxos—and was attributed by the ancients to the mythical Arion. The hymn was sung by a chorus of fifty, generally dressed as satyrs, the companions of Dionysus. At Athens there were annual contests at the Greater Dionysia, Lesser Dionysia, Panathenæa, Thargelia, and Lenæa (see GREEK FESTIVALS), between dithyrambic choruses entered by the ten tribes. The prize in the earliest period was an ox, in the fifth century and later a tripod. Of the hymns of the dithyrambic writers only fragments are preserved.

DITTANY (OF. *ditain*, *dictame*, Lat. *dictamnum*, Gk. *δικταμνον*, *diktamnon*, dittany, from Gk. *Δικτη*, *Diktē*, a mountain in Crete, where the plant grew in abundance), *Dictamnus*. A genus of plants of the order Rutaceæ. The common dittany, also called bastard dittany or fraxinella (*Dictamnus albus*), a native of sunny mountains and rocks and dry mountain forests of the south of Europe, especially in calcareous soils, is cultivated as a garden flower. It is a perennial, with stem 1½ to 3 feet high, perfectly unbranched, bearing a few pinnated leaves, which have three to five pairs of leaflets and an odd one, and terminating in a beautiful erect raceme of ten to twenty flowers of a fine rose-color, with darker veins, more rarely white. When in flower, the plant diffuses a powerful fragrance from its numerous oil-glands, and during dry, hot weather exhales a quantity of volatile oil the sudden combustion of which makes a slight flash when ignited by a candle. The root is thick, white, and very bitter, and was formerly in high repute in medicine as a tonic stimulant. Dittany of Crete (*Origanum dictamnus*), used as a febrifuge, and the dittany of the United States (*Cunila mariana*), are very different plants belonging to the natural order Labiatæ. The latter is found upon dry hillsides from New York to Georgia, and westward to Arkansas. The plant has smooth, heart-shaped leaves, and clusters of small white or purplish flowers.

DITTENBERGER, dĭt′ten-bĕrк-ẽr, WILHELM (1840—). A German philologist, born at Heidelberg. He studied at Jena and Göttingen, and in 1874 was appointed professor of classical philology at the University of Halle. His publications include: *De Ephebis Atticis* (1863); *Inscriptiones Atticæ Ætatis Romanæ* (1878-82; vol. iii. of the *Corpus Inscriptionum Atticarum*, published by the Berlin Academy); *Sylloge Inscriptionum Græcarum* (1883; 2d ed. 1898-1900); *Corpus Inscriptionem Græcarum Græciæ Septentrionalis* (1892); and *Orientis Græci Inscriptiones Selectæ*, vol. i. (Leipzig, 1903).

DITTERS, dĭt′tẽrs (DITTERS VON DITTERSDORF), KARL (1739-99). An Austrian violinist and composer. He was born in Vienna and studied under König, Ziegler, Trani, and Bono. Much of his education was due to the interest in him of Prince Joseph of Hildburghausen, whose orchestra Ditters afterwards led. He was a brilliant violinist, and won wide success, the tour with Gluck (1761) establishing him firmly as a violin virtuoso. He was a prolific composer in almost every department of composition, but little, if anything, of his work remains in use. He had the misfortune to have his undoubted gifts overshadowed by the brilliant genius of Mozart, and little has survived him other than the reputation of preceding Mozart in the realm of dramatic composition. His music is marked by correctness of style, fluency of expression, and beauty of melody. Few musicians of his day met with greater appreciation, had more honors conferred upon them, or held more honorable positions. He died at Castle Rothlhotta, near Neuhaus, in Bohemia. The best edition of his autobiography is that edited by Spazier (Leipzig, 1801).

DIT′TON, Humphrey (1675-1715). An eminent English mathematician. He was for some years a dissenting clergyman, but through the influence of Sir Isaac Newton secured a professorship in the new mathematical school at Christ's Hospital, where he remained through life. He and Whiston devised a new method for determining longitude at sea, but it was rejected by the Board of Admiralty. Ditton's death has been attributed to his disappointment. He was the author of mathematical works, including: *General Laws of Nature and Motion* (1705); *An Institution of Fluxions* (1706; 2d ed. 1726).

DIU, dē-o͞o′ (Gujarati, from Skt. *dvīpa*, island, so called from the situation of the town). A seaport, situated at the eastern extremity of an island of the same name, off the south coast of Gujarat, India (Map: India, B 4). It is fortified, and has a tolerably safe harbor, with a general depth of three or four fathoms. The anchorage, however, is gradually becoming shallower. The place has been in possession of the Portuguese since 1535; from its detached and isolated position its trade is of little consequence. The area of the island is about 2 square miles. Population, in 1894, 13,206.

DIURETICS (Lat. *diureticus*, from Gk. διουρητικός, *diourētikos*, promoting urine, from διουρεῖν, *diourein*, to urinate, from διά, *dia*, through + οὐρεῖν, *ourein*, to urinate, from οὖρον, *ouron*, urine). Medicines having the property of increasing the secretion of urine. They are of several classes: (1) *Vascular* or *cardiac diuretics*, which act by increasing arterial tension or the blood-supply of the kidneys. These include all cardiac stimulants, important representatives being digitalis, caffeine, theobromine, diuretin, convallaria, scoparius, sparteine, apocynin, squill, and strophanthus. (2) *Refrigerant diuretics* include the salts of sodium and potassium, particularly the acetate, citrate, and bitartrate of potassium. (3) *Stimulant diuretics*, or blenorrhetics, are those which have a direct stimulating action upon the genito-urinary tract; such as juniper, turpentine, copaiba, cubebs, oil of sandalwood, buchu, and cantharides. Some of these are extremely irritating, and must be used very cautiously. (4) *Water* is a most important diuretic, increasing the amount of fluid in the blood.

Diuretics are used in conditions in which the quantity of urine is diminished; to aid the absorption of fluid in dropsy or collections of fluid in the body cavities, whether the result of inflammation, such as pleurisy, or of imperfect action of the heart, kidneys, etc.; to aid in the elimination of poisons; and to dilute the urine so as to make it less irritating in inflammations of the genito-urinary tract, or to prevent the formation of calculi, or stones, in the kidneys or bladder. Many of the diuretics mentioned are described in separate articles. Some diaphoretics, such as pilocarpine, at times act as diuretics. The action of diuretics as a class is very uncertain, depending largely upon the individual, and varying in the same person under different conditions.

DI′URE′TIN (from Gk. διουρεῖν, *diourein*, to urinate), or Sodio-Salicylate of Theobromine, $C_7H_7NaN_4O_2 + NaC_7H_5O_3$. A valuable diuretic, especially in cases of dropsy of cardiac origin; but, like all drugs of its class, very uncertain in action. It is a pure diuretic, acting by directly stimulating the cells of the kindey. It occurs as a white powder which is freely soluble in warm water, and remains dissolved after cooling. See Salicylic Acid.

DIURNAL MOTION (Lat. *diurnalis*, daily, from *diurnus*, daily, from *dies*, day). The apparent daily motion of a heavenly body caused by the rotation of the earth on its axis. See Axis; Earth; Planets.

DIVAN, dĭ-văn′. A Persian word, having various significations, being used in the sense of a muster-roll, a register of payments or accounts, or a place for the preservation of a register; and it is also applied to a collection of poems or songs by one and the same author. Goethe uses it in this sense in his *Westöstliche Divan*. Divan means next an administrative board; the highest council of state at Constantinople is called *Divani humayun* ('most illustrious divan'). Finally, 'divan' is the name for the state or reception room in Oriental palaces. Along the walls of the room are ranged low couches, covered with rich carpets, and provided with cushions. Hence the name divan is used for a kind of couch or sofa.

DIVER. The name of several water-birds, especially loons and grebes, remarkable for quick diving—in some cases so quick as to dive at the flash of a gun and escape the shot. The whole order (Pygopodes) to which these birds belong is often spoken of as 'divers.' See Loon.

DIVER, The. A poem by Schiller (q.v.).

DIVERTIMENTO, *Ital. pron.* dē-vâr′tē-män′-tō (It., diversion). (1) A term originally applied to the dances interpolated between the scenes of the older French opera. (2) A composition somewhat like the modern suite (q.v.). It consists generally of five or six movements in free style, but the music is always of a simple character. (3) An entr'acte in an opera. (4) An episode in a fugue.

DIVES, dī′vēz (Lat., rich). A word sometimes used as if it were a proper name for the rich man in the story of Lazarus in Luke xvi., there being no name given to him in the Gospel.

DIVIDE (Lat. *dividere*, to divide). In physical geography, the crest line between the slopes of two drainage systems. The term is used, mostly in the United States, synonymously with watershed.

DIVIDEND (Lat. *dividendus*, to be divided, from *dividere*, to divide). A fund, made up of principal or profits, set apart for distribution among a number of persons ratably entitled thereto; also the portion or share of each person so entitled. In practice the term is not in common use to describe a complete fund distributed once and for all to the claimants or owners, as in the division of partnership assets or the distribution, upon an accounting, of the assets in the hands of an executor or administrator; but it is rather employed to denote the sum available for partial or periodical payments out of such assets or out of current earnings. In this restricted sense it is entirely appropriate to the portion of the assets of an insolvent, or of a company in process of winding up, which is realized from time to time by the trustee or receiver and distributed among the creditors or shareholders. The most common use of the term, however, is to describe those profits or earnings of a corporation or joint-stock company which are set apart for distribution among the members and stockholders.

It will be noticed that such assets and earnings while yet unappropriated are not dividends, and that it is their formal appropriation to the purpose of distribution which gives them that character. As soon as this has been done, and not before, they are treated by the law as the property of the persons entitled thereto under the terms of the appropriation, and such persons may accordingly demand and recover them as 'money had and received to their use.'

As applied to corporations, the term dividend has been defined to be "that portion of the profits and surplus funds of the corporation which has been actually set apart by a valid resolution of the board of directors, or by the shareholders at a corporate meeting, for distribution among the shareholders according to their respective interests, in such a sense as to become segregated from the property of the corporation and to become the property of the shareholders distributively."

The declaration of dividends is one of the usual powers of directors, and, unless controlled by the charter or by-laws of the corporation, they may usually fix the amount of the dividend, and the time and place of payment, at their sole discretion, subject only to the obligation of good faith with the stockholders. Dividends cannot usually be declared out of the capital, but only from the profits; but there is no obligation on the directors to appropriate all or any particular portion of the profits to this purpose, though the contrary has been held in England. It has also been held in England that dividends must be payable in money; but in the United States dividends are often paid in the stock, bonds, or scrip of the corporation. When dividends declared from time to time do not exhaust the profits, the surplus thus accumulated may be appropriated in whole or part as an 'extra dividend' or bonus.

As between a person having a limited interest in corporate shares, as a life tenant, and the person entitled thereto in the future, the question may arise as to whether dividends earned but not declared during the ownership of the shares by the former, or dividends declared out of accumulated earnings, belong to the former as profits or to the latter as capital. Commonly this is solved by applying the rule, previously laid down, that no one becomes entitled to earnings until they have been appropriated in the form of a dividend. It is usually held also that extra dividends declared out of surplus earnings shall always be regarded as profits in the same way as those declared out of current earnings. See CORPORATION; DIRECTOR; STOCKHOLDER; STOCK; DEBENTURE, and the authorities referred to under those titles.

DIVIDING ENGINE, or RULING ENGINE. A machine devised to rule fine lines at regular intervals by means of a diamond point or other sharp edge. The most common use of such machines is for the purpose of dividing the circumference of a circle into degrees and minutes or other divisions as is necessary in the construction of surveying and astronomical instruments, micrometer screws, spectrometers, and other physical instruments, as well as in many commercial machines; and also for the purpose of dividing a length into aliquot parts as in the making of meter rods and similar instruments. Another use to which they are put is that of the preparation of diffraction gratings (q.v.), in which it is necessary to have the means of ruling a great number of lines, exactly parallel and at exactly equal small intervals apart. Gratings are made with as many as 100,000 lines in a distance of five or six inches.

The first instrument for the ruling of gratings was made by Joseph von Fraunhofer (q.v.); others have been made by Rutherfurd, Rowland, and Michelson; but all are based on the same general principle. The machine consists of a cylinder on which a screw-thread is cut and which carries a large nut, the two together being like an ordinary bolt and nut. The ends of the screw are held in yokes, so that it can turn on its axis, and the nut is held on 'ways' parallel to the screw. Thus, as the screw is turned by a crank or otherwise, the nut advances or recedes. A cutting edge is set at some point above the screw, in such a manner that it can be made to make a line at right angles to the axis of the screw. The piece of glass or metal on whose surface the rulings are to be made is attached to the nut, and the operation is as follows: A line is made by the cutting edge; the screw is turned through a certain fraction of a complete revolution—e.g. one-thousandth—thus carrying the nut and the surface forward a small distance; a second line is ruled; the screw is again turned through the same angle as before; a third line is ruled, etc. Thus, if the pitch of the screw is 20—i.e. if there are 20 threads or spirals on the screw in each inch along its length—there will be 20,000 lines per inch ruled on the grating surface. The nut is split in two, the halves being hinged at the top and having below two projections or 'wings.' When the machine is to be used, these are clamped together. At the end of the ruling the wings are opened, and the nut, being thus released from the screw, can be pushed back to the starting-point.

It is evident that the machines must be rigid, the 'ways' exact, the screw of perfectly uniform pitch, the turning of the screw regular, the cutting of the line exactly straight. All modern machines are automatic; a large toothed wheel is attached to the screw at one end, and this turned by levers, one tooth at a time; the cutting edge is a diamond point which is allowed to drop on the ruled surface, is drawn across, then lifted, pushed back to the original position, etc. There are always periodic errors in the use of any dividing engine, occasioned by irregularities in the toothed wheel, the end of the screw which butts against some fixed support, and elsewhere. These may be counteracted by a device due to Rowland which depends upon the action of a lever resting on a cam attached to the axis of the screw. The end of the lever is rigidly fastened to a rod which is parallel to the screw, and to which is attached, by means of a short crank, a framework supported under the screw and free to move horizontally. Part of this framework consists of two steel rods parallel to the screw, between which the two 'wings' of the nut can just move freely, as the nut is carried forward by the screw. Thus, if the cam raises its lever, the rod will turn, moving the framework holding the wings of the nut, and thus giving the nut a slight turn independent of the action of the screw. It is a matter, therefore, of trial to find a cam of such a shape, and to place it on the axis of the screw in such a position, that by its motion the irregular motion of the nut due to the irregularities of the machine may be made perfectly regular. For a description of the construction of a 'perfect' screw, reference should be made to the article "Screw," by Rowland, in the *Encyclopædia Britannica.* A full description of Rowland's dividing engine is given in *The Collected Papers of Henry A. Rowland* (Baltimore, 1902).

DIVI-DIVI, dē′vē-dē′vē (Galibi or Carib word), or Libidibi. The cured pods of *Cæsalpinia coriaria,* a tree which grows on the coasts of Curaçao, Carthagena, and other parts of tropical America. They have been long used there for tanning, and have recently acquired importance as an article of commerce. Divi-divi is one of the most astringent substances known. The tree reaches a height of 20 to 30 feet, and produces about 100 pounds of pods annually. The pods contain tannin and gallic acid. It is said to tan leather with great rapidity. See Cæsalpinia.

DIVINA COMMEDIA, dē-vē′nȧ kŏm-mā′dē-ȧ. See Dante.

DIVINATION (Lat. *divinatio,* from *divinare,* to divine, from *divinus,* divine, from *divus,* deity). A term employed to describe the quest of a knowledge of secret things, past, present, or future, by various supernatural methods, principally oracular responses and omens. As the origin of the word indicates, the idea is based on the assumption that human intelligence may obtain knowledge from the divine mind through media affected by divine influence. The Greek term μαντικὴ (τεχνή) suggests the inspired intermediary μαντίs (seer), a word which Plato and the Greeks associated with μανία (inspired frenzy). The contact of the divine mind with human intelligence was believed to be accomplished either through a medium directly, or by signs and omens which were interpreted by the medium. The Stoic philosophers recognized this difference in method (Cicero, *De Divinatione,* i. 6, 33, and ii. 11). and designated the first ἄτεχνος, *naturalis* (artless), i.e. the direct or natural method; and the second ἔντεχνος, *artificosa,* i.e. the artificial method. Bouché-Leclercq terms the first the intuitive and the second the inductive method, because the artificial class admits of some spontaneity and the natural something artificial.

The natural, the intuitive method is very familiar as represented by oracles, a term used to denote both the seat of divination and the responses themselves. For these responses the seats of worship of divinities were regarded as favorite localities, and were generally marked by some peculiar physical characteristic, as a cleft in the ground whence an exhalation arose by which the medium was made to pass into a trance. There were several methods in which information from the divinity was communicated by the oracles: *Divination by dreams* (oneiromancy) required experience in dreams and the interpretation thereof. Persons desiring revelation by this means would go to sleep in places thought to be haunted by dreams, such as tombs of heroes and temples of divinities. As the body must be inert and the mind passive, various means were employed to accomplish this, as refraining from wine and food for a certain period. Means were also taken to summon the dreams by incantations and by unusual conditions of sleeping, as when one lay on the skin of a ram slain by him. This method was known as incubation (ἐγκοίμησις). Such was the oracle of Amphiaraus at Oropus, near the spot where the hero became a god. Of this kind the most familiar oracles were healing shrines connected with the temples of Æsculapius. *Necromancy* was the method whereby revelation was conveyed by the shades of the dead who were summoned for the purpose. In Homer, Odysseus goes to the entrance of the lower world to consult the shade of Tiresias. These oracles were given at places recognized as approaches to the lower world, as Lake Aornos in Thesprotia, and Lake Avernus near Cumæ in Italy. *Chresmology,* or divination by frenzy (*vaticinatio* or *divinatio per furorem*), was the revealing of the will of the divinity by seers. Being in a state of frenzy, superinduced by exhalations or draughts of water from certain streams, or of blood, as of a lamb, they spoke forth the prophetic words either from a presentiment or an inspiration by the divinity, or from becoming, as was fancied, the incarnation of the divinity for the time being. The most famous oracle of this class was at Delphi, situated on the side of Mount Parnassus in Phocis, which, originally belonging to Gæa, then to Themis, the representative of law and order, finally came into the possession of Apollo, whose priestess, Pythia, gave his answers by means of her cries.

The artificial or inductive methods of divination admit of the following classification: *Divination by instinctive acts of animals.* Under this heading is therefore placed ornithomancy, ichthyomancy, etc. This refers to revelations obtained from the behavior of birds and fishes, particularly of the former, who, being in the heavens, come close to the divinities and can act as messengers. With these should also be classed the instinctive or unconscious acts of man. Such was the divination by omens, so familiar to the Romans. The well-known story of Crassus is an illustration. Starting on his ill-fated expedition against the Parthians, he heard a man selling figs from Caunus, and crying 'Cauneas,' which sounded like *Cave ne eas* (Beware of going). Here we may also place the modern divining-rod (q.v.) which is said to bend when held over concealed springs of water or mineral deposits. This custom is known in England as 'dowsing.' See Murray, *New English Dictionary.*

Divination by haruspication. This method was the interpretation of the divine will by studying the entrails of victims. Practiced in very remote antiquity in the East, in Egypt, Cyprus, and Etruria, it was familiar to the Greeks of the fifth century B.C., but not in Homeric days. It passed from Etruria to Rome, where it served the purposes of statesmen (Cicero, *De Divinatione*, ii. 12). The nearest approach to this in recent days is palmistry, or reading the lines of the hands, and the old 'reading of the speal-bone,' called omoplatoscopy or scapulimancy, which is the inspection of the lines in the shoulder-blade. *Divination by fire* (empyromancy). This consists in observing the effect of fire from the altar on wood, or on the offering, or again in watching the movements of the smoke and the wine of a libation. *Divination by water* (hydromancy) consisted in the observation of objects cast into water. *Divination by lots* (cleromancy) was a method which required a movement consciously begun and directed by chance. Here may be placed *axinomancy,* which is the consideration of the movements of an axe placed on a post; *coscinomancy,* or the observing of the results of the turning of a sieve hung on a thread; or again, *dactylomancy,* or the interpretations of the oscillations of a ring hung over a circular vase against which it strikes. This is a method of great antiquity, and is found in Homeric days. Among the Romans *sortilegium,* or casting of lots, belonged to this experimental form of divination. Small tablets of wood, bone, or bronze were inscribed with various sayings, and when shuffled and drawn gave the prophecy. A number of them have come down to our own times, and are described in *Corpus Inscriptionum Latinarum,* 1. pp. 268-70. The term *sortes* was also given to selections from books used for a similar purpose. Compare with this the chance reading of the Scriptures. Lines from the great poets, particularly Vergil, were also employed as *sortes Vergilianæ* as mentioned by Spartianus in his *Hadrian II.* In England, Charles I. is said to have opened to Æneid iv. 615, when consulting Vergil in the Bodleian Library at Oxford. Dice were also used by the Romans in this way. *Divination by meteorology* is represented by the study of lightning flashes and interpretation of them. Such were the *signa ex cœlo* interpreted by the augurs and haruspices. *Divination by astrology* was the most important in antiquity, and consisted of predictions made after observing the heavenly bodies. It arose among the Chaldeans, then passed to the Greeks, and finally to the Romans, among whom the term for astrologers was *Chaldæi* or *mathematici.*

BIBLIOGRAPHY. Consult: Cicero, *De Divinatione;* Plutarch, *De Pythiæ Oraculis,* and *De Defectu Oraculorum;* Mezger, "Divinatio," in Pauly, *Realencyclopädie,* ii. pp. 1113-1185 (Stuttgart, 1842); Maury, *Histoire des religions de la Grèce antique—La divination et les oracles,* vol. ii., pp. 431-539 (Paris, 1857); Schneider, *Die Divinationen der Alten mit besonderer Rücksicht auf die Augurien der Römer* (Költhen, 1862); Fontaine, *De Divinationis Origine et Progressu* (Rostock, 1867); König, *Das Orakelwesen im Alterthum,* Programm (Crefeld, 1871); Hoffmann, *Das Orakelwesen im Alterthum* (Stuttgart, 1877); Bouché-Leclercq, *Histoire de la divination dans l'antiquité* (4 vols., Paris, 1879-1882); also article "Divination" in Daremberg et Saglio, *Dictionnaire des antiquités:* Dechambre et Thomas, article "Divination" in *Dictionnaire des sciences médicales,* vol. xxx., pp. 24-96 (1884).

DIVINE RIGHT. A term of ancient origin, which came into general use in the seventeenth century during the factious contentions of English Royalists and Parliamentarians. The Royalists maintained that as 'the Lord's anointed,' and the immediate representative of the Deity, all power and government were vested in the King, who 'could do no wrong;' a doctrine which relieved him from human responsibility. The Parliamentarians contended that the exercise of political power sprang from the will of the people, by what was termed 'the social contract.' The opponents of divine right included Milton, Algernon Sidney, and Harrington, and its chief supporters were Hobbes, Salmasius, and Sir Robert Filmer, whose *Patriarcha* contains a complete exposition of the theory. The idea can be traced through the Middle Ages and beyond, in the assumed 'divine authority' of the magistracy; in the history of the Roman Catholic Church it is found in the doctrine of the Pope's infallibility. The settlement of the crown on William and Mary ended the British controversy, but a similar controversy was revived in the discussions which caused the French Revolution.

DIVINE TRAGEDY, THE. A dramatic poem by Longfellow (1871), forming the first part of his trilogy *Christus.*

DIVING (from *dive,* AS. *dyfan,* causative of *dūfan,* to plunge). The act of working under water—either with or without mechanical aids to enable respiration—as in pearl and sponge fishing, the raising of sunken vessels, the laying of subaqueous foundations, or other operations under water. Formerly diving operations were confined mostly to pearl and sponge fisheries and were performed by divers who plunged beneath the water, remained as long as they were able to do without respiration, and then returned to the surface with their load. It has been asserted that the pearl-divers of the East acquired by practice the power to remain under water for fifteen or twenty minutes. There is absolutely no truth in such assertions, as no such endurance is possible; two, and sometimes three, minutes under water is the limit of endurance of the most skillful divers unaided by mechanical means to support respiration. Most divers suffer severely from the continual efforts in holding the breath; bloodshot eyes and the spitting of blood are common among them. This rude method of diving is but little used now, even in the pearl and sponge fisheries, where it is particularly applicable. Diving operations are now performed by means of diving-bells or special diving-dress.

DIVING-BELL. The *cacabus aquaticus,* or aquatic kettle, described by Taisnier as having been used by two Greeks in Spain, at Toledo, in 1538, in the presence of the Emperor Charles V. and a multitude of spectators, is one of the earliest reliable accounts of a diving-bell. From his description, this must have been similar in principle and construction to the modern diving-bell, but of clumsy dimensions, and wanting in efficient means of renewing the supply of air. Dr. Halley's diving-bell, devised about 1720, was a wooden chamber, open at the bottom, where it was loaded with lead to keep it perpendicular in its descent. Strong pieces of glass were set in the upper part to admit light. Casks filled with air, and loaded with lead, were let down with the bung-hole downward;

and from these a supply of air was drawn by means of a hose. The form of diving-bell now in use was first constructed by Smeaton for the works at Ramsgate Harbor, England, 1788. It was of cast-iron, and weighed 50 cwt.; its height, 4½ feet; length, the same; and width, 3 feet. It sank by its own weight, and was lighted by stout pieces of bull's-eye glass firmly cemented by brass rings near the top. The principle of the diving-bell will be easily understood by floating a piece of lighted candle or a wax match on a cork, and then covering it with an inverted tumbler, and pressing downward; the candle will descend below the level of the surrounding water, and continue burning for a short time, although the tumbler be entirely immersed. The reason is obvious enough; the air in the tumbler, having no vent, remains in it, and prevents the water from occupying its place, so that the cork and candle, though apparently under water, are still floating, and surrounded by the air in the tumbler; the candle continues burning until the oxygen of the air is exhausted, and then it goes out, as would the life of a man under similar circumstances. If vessels full of air, like the barrels of Dr. Halley, were submerged, and their contents poured into the tumbler, the light might be maintained; but this could better be done if a tube passed through the tumbler, and air were pumped from above through the tube into the tumbler.

An account of early diving-bells and apparatus will be found in Gerland and Traumüller's *Geschichte der Physikalischen Experimentierkunst* (Leipzig, 1893).

The modern diving-bell, which is made of cast-iron like Smeaton's, is supplied with air in this manner. It must be remembered that air is compressible, and diminishes in bulk in proportion to the pressure, so that at a depth of about 33 feet in water it would occupy half the space it filled at the surface; if the inverted tumbler were carried to this depth, it would be half filled with water. A considerable quantity of air has, therefore, to be pumped into the diving-bell, merely to keep it full as it descends; the air thus compressed exerts a corresponding pressure, and would rush up with great force if the tube were open and free. This is prevented by a valve opening downward only. When the diving-bell has reached its full depth, the pumping is continued to supply air for respiration; and the redundant air overflows, or rather *under*flows, by the open mouth, and ascends to the surface in bubbles. The diving-bell is provided with a platform or seat for the workmen, and suspended from a suitable crane or beams projecting from a barge or pier; men above are stationed to work the pumps and attend to the signals of the bellman. These signals are simply made by striking the sides of the iron diving-bell with a hammer, and as sound is so freely communicated through water, they are easily heard above. Owing to their great weight and clumsy operation, diving-bells are now seldom used in subaqueous operations, the modern appliance being the diving-dress or diving-armor.

Diving-Dress. In Schott's *Technica Curiosa*, published in 1664, is described a *lorica aquatica*, or aquatic armor, which consisted of a leathern dress, to protect the diver from the water, and a helmet. In 1721 Halley describes a contrivance of his own of nearly the same kind; its object was to enable the diver to go out from the bell and walk about; he was to be provided with a waterproof dress, and a small diving-bell, with glass front, as a helmet over his head, which was to be supplied with air by means of a tube from the diving-bell. In 1798 Kleingert of Breslau invented a diving-dress available for depths up to 20 feet. The head and body of the diver were encased in cylindrical tin-plate armor, and his legs in leather breeches. Fresh air was conveyed to him and the vitiated air was removed by means of pipes. In 1829 August Siebe devised an open-helmet diving-dress, having a copper helmet and breastplate, with attached canvas jacket below which the air was allowed to escape, but to avoid the admission of water the diver was forced to keep a vertical position. In 1839 Siebe improved his dress, which now is a waterproof costume with helmet of tinned copper, having circular glasses in front, valves to admit and discharge air, and a signal-line to allow communication with those above water. The weight of the dress is about 275 pounds. In 1880 Fleuss invented a dress weighing only 20 pounds. This has a copper cylinder fastened to the back, carrying a supply of compressed oxygen. The carbonic acid exhaled by the diver is absorbed by caustic soda in a receptacle fixed above the copper cylinder, while the nitrogen is breathed over and over again. In this dress the diver may remain several hours below the surface. For lighting, arc and incandescent lights are used, as well as improved oil-lamps supplied with air by force-pumps. Slates and signal-lines are used for purposes of communication. According to Siebe the greatest depth to which a man has ever descended is 204 feet; equivalent to a pressure of 88½ pounds per square inch.

On all ships of the United States Navy, except very small ones, there is a complete diver's outfit. Nearly all gunners' mates are now instructed in diving and all recently appointed gunners and boatswains are thoroughly conversant with the work, as are also the carpenters. Divers are used for examining the bottom, or cleaning it, overhauling the strainers of submerged pipes, scraping the propellers, examining chains, looking for articles lost overboard, etc. Men who are qualified divers are given $1.25 for each hour actually spent in diving in addition to the ordinary pay of their rating.

DIVING BEETLE. An aquatic predaceous beetle of the family Dytiscidæ. These beetles are flat, oval, and, when not disturbed, hang head downward in the water with only the tip of the abdomen touching the surface. They may be distinguished by the thread-like antennæ. They are brownish black in color, sometimes with indistinct yellow markings. These beetles are very voracious and feed on other insects, worms, and even small fish; fly at night with ease, and frequently congregate about electric lights, and some forms make a sound both in and out of water. Their eggs are laid in the water and the larvæ are known as water-tigers. The transformation of the larvæ is undergone in a cell in the earth. Nearly 300 species of this family are known. The two genera to which the largest American diving beetles belong are Cybister and Dytiscus, distinguished by the disks on the tarsus, which are in four rows and similar in Cybister, while they are variable in Dytiscus.

The medium-sized forms belong to the genera Acilius and Colymbetes, the former having the wings finely punctured, and the latter striated. The larvæ of all forms can easily be kept in confinement if fed on bits of cooked or raw meat.

DIVINING-ROD (often called *virgula divina, baculus divinatorius, caduceus* or *wand of Mercury, rod of Aaron,* etc.). A forked branch, usually of hazel, and sometimes of iron, and even of brass and copper, by which it has been pretended that minerals and water have been discovered beneath the surface of the earth. The rod, when suspended by the two prongs, sometimes between the balls of the thumbs, is supposed to show by a decided inclination the spot under which the concealed mine or spring is situated. Other powers are ascribed to the divining-rod, but this is the chief. Many persons, even of some pretensions to scientific knowledge, have been believers in the occult power ascribed to this magic wand. Agricola, Sperlingius, and Kirchmayer all believe in its supernatural influence. Bayle, in his dictionary, under the word *abaris,* gives some ingenious arguments both for and against the divining-rod. In a work published in 1847 and 1851, entitled *On the Truth Contained in Popular Superstitions,* Dr. Herbert Mayo gives a curious collection of alleged discoveries made by this divining-rod.

DIVISCH, dĕ'vĭsh, Procopius (1696-1765). An Austrian scientist, born in Senftenberg. He entered the Præmonstrant Order, and became pastor at Brendiz. In 1754—and thus two years after Franklin's kite experiment—he erected in an open field the first lightning-conductor on the Continent. The apparatus was destroyed by the peasants, who attributed to it the drought of the succeeding summer.

DIVISIBILITY (from Lat. *divisibilis,* divisible, from *dividere,* to divide). That property of quantity, matter, or extension, through which it is either actually or potentially separable into parts. Whether matter is or is not indefinitely divisible, is a question which has occupied the minds of philosophers since very early times. The diffusion of odors through the air for long periods from odoriferous bodies without their suffering any sensible change of weight, and the tinging of great quantities of fluid by very minute portions of coloring matter, are cases commonly appealed to in proof of the great divisibility of substances. On the other hand, abstractly speaking, matter must be conceived as infinitely divisible for the reason that the division of matter is necessarily the division of the space it occupies; and the infinite divisibility of space may be demonstrated geometrically. However, this abstract Cartesian demonstration of the infinite divisibility of matter does not prove that there is no limit to the subdivision of matter that may be effected by processes actually taking place in nature. Against this infinite divisibility of matter by natural agencies is the atomic hypothesis, strongly supported by all the many facts correlated by it. Possibly in favor of something like infinite divisibility is J. J. Thomson's theory of radio-activity, supported by the division of the radium and actinium "atoms" into helium "atoms"; which plainly suggests the possibility of a division of even the smallest known or conceivable particles. See Gases, Properties of; Matter, General Properties of; and Molecules—Molecular Weights.

DIVISIBILITY (in Mathematics). See Division.

DIVISION (OF. *devision, division,* Fr. *division,* from Lat. *divisio,* from *dividere,* to divide). In logic, the process of distributing all the objects included in the denotation (q.v.) of a concept (q.v.) into mutually exclusive classes, each of which is marked off from the others by the possession of some distinctive attribute. Logical division must not be confounded with physical division. In the former the whole (called genus) can be predicated of the resultant parts (called species, see Predicables); in the latter such predication is not possible. Thus, when Cuvier divided his order of primates (q.v.) into homo, simia, lemur, and vespertilio, he performed a logical division because the whole thus divided, primate, is predicable of every one of the parts obtained; in other words, it can be said that *man is a primate.* But when a man is dissected into head, trunk, feet, etc., the division is not logical, but physical, because the whole cannot be predicated of the parts; we cannot say that *the head is a man.* Traditional logic generally gives the following rules for correct division: First, the division must be exhaustive; i.e. the sum of the denotations of the species must be exactly equal to the denotation of the genus. Second, the division must be exclusive; i.e. no object found in the denotation of any species must be found in the denotation of any other species. Third, in order to secure conformity to the above rules the division should be based on some one characteristic in regard to which the various objects in the denotation of the concept to be divided differ from each other. This characteristic used as the basis of division is called the *fundamentum divisionis.* Thus when plane triangles are divided into scalene, isosceles, and equilateral triangles, the *fundamentum divisionis* is the relative length of the sides of triangles.

DIVISION. In mathematics, one of the four fundamental processes of arithmetic, the one by which we find one of two factors when the product and the other factor are given. The given factor is called the *divisor,* the given product is called the *dividend,* and the result (i.e. the required factor) is called the *quotient.* The definition of division leads to the following identity: dividend = divisor × quotient + remainder. If the remainder is zero, the division is said to be exact. The common symbols for division are: $\frac{a}{b}$, $a \div b$; $a : b$, a/b, ab^{-1}, in which a is the dividend and b the divisor. Two forms of division are recognized in elementary arithmetic, the one based on the idea of measurement and the other on the idea of partition. The former is the case of dividing one number by another of the same kind, and the latter that of dividing a concrete by an abstract number.

The usual tests of the correctness of division are: (a) multiply the quotient by the divisor and add the remainder, the result equaling the dividend; (b) compare the excesses of nines in the identity of division. See Checking.

Simple tests of the divisibility of numbers by 2, 4, 5, 6, 8, 9, 10, 11 are: (a) a number is divisible by 2, 4, or 8 if the number represented by the last digit, the last two digits, or the last three digits is divisible by 2, 4, or 8 respectively; (b) a number is divisible by 5 if it ends in 0 or 5, by 10 if it ends in 0; (c) a number is divisible by 9, or by 3, if the sum of its digits is divisible by 9, or by 3, respectively, and by 6 if it is even, and the sum of its digits is divisible by 3; (d) a number is divisible by 11 if the difference between the sum of the digits in the odd and in the even places is divisible by 11. The simplest test of the divisibility by algebraic binomials is that of the remainder theorem (q.v.). The division of large numbers is generally facilitated by the use of logarithms (q.v.). For the origin of the present method of division and for improved forms, see ARITHMETIC.

DIVISION. In military organization, a component part, consisting usually of two or more brigades. The term is sometimes used as a classifying title, as 'the cavalry division,' 'infantry division,' etc. The strength and composition of a division vary in times of peace according as alterations are made in tactical or organization dispositions and in time of war according to the needs of the work for which the division is formed. In the United States Army, a division consists of two, three, or four brigades, including all branches, under the command of a major-general. In Germany, an infantry division consists of two brigades to which, under the command of the general commanding, are attached four squadrons of cavalry, four batteries of artillery, each of six guns, and a battalion of riflemen, or, in some instances, pioneers. A division differs from the *corps d'armée* in that the latter is invariably complete in itself, while the former is only occasionally so, and then on a very much smaller scale. See ARMY ORGANIZATION.

In naval usage, a division is a group of ships constituting a part of a fleet, or one of the parts into which the crew of a man-of-war is divided. See SHIP'S COMPANY.

DIVISION OF LABOR. In political economy, an expression designating, somewhat awkwardly, the fact that in modern production each workman performs a part only of the process of manufacture. His work is coördinated with that of others to complete the whole. The fact of division is dependent on the fact of coöperation, which is the essential feature. Foreign economists have deemed it wise to use the more general term 'coöperation,' but in English economics the term division of labor has become consecrated through the labors of Adam Smith, and it would be idle at this late day to substitute the more exact formulation. Adam Smith drew attention to the increased productiveness which results when, in the process of manufacture, the several operations are apportioned to different workmen, so that each workman shall perform continually one operation, instead of performing several in succession. This is the narrowest view of the division of labor, and subsequent writers have extended the term so that it includes not only the separation of processes in one employment, but also the separation of employments. The fact that one man is exclusively a carpenter and another exclusively a smith enhances their combined production over what it would be if each were a jack-of-all-trades. Other writers have still further extended the notion, and speak of a national division of labor, by which they would designate the peculiar aptitudes of certain nations for certain branches of production, and which under a system of unrestricted commerce would probably promote a contrast between the economic activities of the several parts of the world. The division of labor has become one of the commonplaces of modern industry, and we do not perhaps sufficiently realize how entirely the effectiveness of modern production rests upon it. It may be well to review briefly the advantages of the division of labor set forth with so much skill by Adam Smith, which subsequent experience has so amply verified. In the first place, it promotes in a high degree the skill of the laborer. By devoting his energies solely to one operation, he acquires in it a dexterity which could not have been obtained if his attention had been given to many things. The hand that daily performs the same task comes to do it almost automatically. With the better separation of labor, it is possible to employ persons according to their capacities. While some operations require great strength, others demand nicety of touch and extreme delicacy of handling. The weak, who find no place in the ruder labors of agriculture or mining, find in manufacturing a place for their labor. Without discussing at this point whether the increase of the labor of women and of young persons has been a social benefit, we can readily see that the division of labor which has made it possible has increased the national production by practically increasing the number of laborers, and diminishing the relative number of dependent persons. Another advantage of division of labor lies in the saving of labor and of time. The skilled workmen make better use of the materials intrusted to them than do those who are not trained, and thus prevent waste; while the continuity of employment practically increases working hours by saving the time which would otherwise be spent in passing from one employment to another. To realize what this means, one has only to compare the labors of the agricultural population, where division of labor is not practicable to the same extent as in other forms of production, with those of the artisan classes. Not the least advantage resulting from the division of labor is the stimulus which is given to invention by the concentration of energies upon distinct and definite processes. While it may be true that learned men have made some of the most noted inventions of our time, it is equally true that the many thousands of modifications of tools and machines which have made them feasible and workable have come largely from those who have been in daily contact with their operation.

The discussion which has been given here has been in view of the separation of employment in the operations of a workshop or a factory, but it must be equally obvious that like gains result from the differentiation of functions among the people generally from the increase of specialism, not only in trade and commerce, but also in professional and scientific activities. Nor need space be given to the demonstration of the fact that the division of labor between localities and between nations creates in each special aptitudes which might not otherwise be awakened, and thus increases the sum of gratifications which are in the reach of mankind at large. To offset these advantages, which are almost self-evident, there have been urged against the division of labor disadvantages of considerable weight. It has been contended that the production of a workman whose only knowledge was how to polish the point of a pin was a pitiable spectacle for which modern industry was responsible. Not only is it urged that such extreme specialization is deleterious to the intelligence and that it saps the vitality, but it has been pertinently pointed out that in the revolutions to which industry is subject such a man might find himself without a place, and without a living. When the facts are as stated, there can be no question of the hardship caused the individual. But the case is probably extreme. While it is true that well-rounded workmen are less frequent to-day than formerly, it is also true that the mechanical operations of factories are not so widely dissimilar that one who is displaced from one type of factory might not find suitable employment in another, with somewhat similar operations, but with somewhat different materials. Nor should it be forgotten that in comparisons between the workman of to-day and the man of yesterday, it is not infrequent that the average man of to-day is compared with the skilled man of yesterday, and that while years ago there were many skilled carpenters, there were also many who were quite unskilled, and the man who at the present time performs a single operation in a planing-mill has perhaps deteriorated from the skilled and efficient craftsman who was his predecessor, but has risen on the other hand from one who bungled at the trade because he had not the aptitude to acquire skillfully all of its processes, and was not permitted under the older organization to devote himself to that one in which he would have been most efficient. It is further pointed out that with the subdivision of industry, and the increasing use of machines, there is opportunity through the reduction of working hours for mental development outside, even if the mental stimulus which comes from the work itself is not so great as formerly. In short, the disadvantages of the division of labor which were set forth with so much apprehension by writers of fifty years ago have not in the development of things proved so serious in their effects upon the working classes as they appeared. There can be little doubt that during the century just ended the progress of the working classes, not only in their material welfare, but in their intellectual development, has been greater than in any preceding period of the world's history. See POLITICAL ECONOMY; PRODUCTION.

DIVITI'ACUS, or DIVICIACUS. A Druid and chieftain of the Æduі, a tribe of ancient Gaul, dwelling between the upper waters of the Saône and the Loire. His tribe enjoyed a friendly alliance with the Roman Government, and Divitiacus himself visited Rome, where Cicero conversed with him on the subject of Druidism (*De Divinatione*, i. 41, § 90). When Cæsar, in B.C. 58, refused to allow the Helvetii (q.v.) to migrate from their lands in Switzerland and settle in Gaul, he relied on the Æduans and Divitiacus to furnish supplies for his army; but Dumnorix, a brother of Divitiacus and a bitter enemy of Cæsar, had, by bribery and intimidation, secured the chief power among his people, and the supplies were withheld. Cæsar learned the facts, suppressed Dumnorix, restored Divitiacus to power, and, with the supplies thus assured, crushed the horde of Helvetii near the town of Bibracte (Cæsar, *B. G.* i. 16 sq.). Divitiacus remained a faithful ally of Cæsar during his further campaigns.

DIVORCE (Lat. *divortium*, from *divertere*, to go apart). Divorce, at modern law, is a dissolution of marriage, by public authority, at the instance of one of the parties, for a cause that has arisen since the establishment of the connubial relation. Divorces are sometimes granted by the law-making power, but usually by the courts under general laws. A judicial declaration that two persons who have gone through the form of contracting marriage are not husband and wife (as in the case where one of the parties was already married to a third person) is not a divorce; nor is the term divorce properly applied to an annulment of marriage for a cause that antedates or has accompanied the establishment of the marriage (e.g. impotence or fraud). Again, a judicial separation which merely relieves the parties of some of the duties and suspends some of the rights connected with the connubial relation is not a divorce, for divorce destroys the connubial bond itself.

HISTORY OF DIVORCE. In early society the husband usually had the right of repudiating his wife, originally, perhaps, at pleasure, among some races only for cause. Primitive causes were witchcraft, drunkenness, barrenness, adultery. In those communities in which the man became a member of his wife's family power to repudiate him was usually accorded to her or to her kinsfolk, as was the case among some tribes of North American Indians. Among the Athenians the husband could dismiss his wife at pleasure, and the wife could leave the husband with the consent of the magistrate (*archon*). In ancient Rome the rules governing divorce depended upon the form of marriage. If the parties had entered into a religious marriage (*confarreatio*), divorce was possible only by another religious ceremony (*diffarreatio*), which, like the marriage, required the coöperation of the priests. If the marriage was in form a purchase (*coëmptio*), the wife could be reconveyed into her original family only for grave misconduct. If, however, the marriage was 'consensual'—and this type of marriage became general in the later Republic—it was dissoluble by dissent; i.e. either party could repudiate the other. To the Romans of the early Empire this freedom of divorce seemed morally right; and as late as the third century of our era the Roman jurists held that a promise not to exercise the right of divorce under any circumstances was an immoral promise. Even when the Empire became Christian, the right of divorce at will was not abolished; all that was done was to impose pecuniary disadvantages upon the party who exercised the right of divorce without good cause, or upon the party whose misconduct gave good cause for divorce. In the view of the Christian Church, however, marriage was a sacrament, and the matrimonial relation was indissoluble; and in the Middle Ages, when the Church courts obtained jurisdiction over marriage, this view determined the law of Europe. Marriages might be declared null because of impediments which existed at the time of marriage, but marriages could not be dissolved because of any subsequent misfortune or misconduct. This is still the law in some of the European States, e.g. in Italy, Spain, and Portugal, and in Austria so far as members of the Roman Catholic Church are concerned. Divorce reappeared with the Reformation, and was part of the programme of the French Revolution; and in the great majority of the European States (and in Austria, as regards non-Catholics) divorces can be obtained at the present time on various grounds—always for adultery and for extreme cruelty, usually for desertion, and in some States on the ground of condemnation in criminal proceedings, when the condemnation carries with it infamy or degradation, and on the ground of incurable insanity. Incompatibility, strained relations, unconquerable aversion, etc., are grounds usually for separation only; but in some States a separation obtained on such grounds may, after a term of years, be converted into an absolute divorce. Divorce by mutual consent was permitted by the Code Napoléon, and also, when the marriage was childless, by the Prussian Code of 1794; but divorce on this ground is not permitted by the existing legislation of France nor by the German Imperial Code. In the former country the subject is now regulated by legislative act of 1883. The idea that marriage is something more than a private relation, that it is the basis of the existing social order, and that society is interested in its maintenance, finds expression not only in the rule that divorce is to be granted only for cause, but in the practice of making the official who corresponds to the American district attorney a party to every proceeding for divorce or annulment of marriage.

In England there was no common-law jurisdiction in matrimonial causes prior to the creation of a divorce and matrimonial court by act of Parliament in 1857, and the ecclesiastical courts, to which that jurisdiction was confided, consistently held the marriage tie to be indissoluble. Accordingly, before January 1, 1858, when the Matrimonial Causes Act (20 and 21 Vict., c. 85) went into operation, divorces could be obtained in England (as is still the case in Ireland) only by act of Parliament. It was, indeed, possible to obtain a declaration of nullity of marriage on the ground of consanguinity, previous marriage of one of the parties, mental or physical incapacity, coercion, or fraudulent representations as to the essentials of the relation, as, for example, false impersonation. But the judgment so obtained was not a decree of divorce, but a declaration that the marriage tie between the parties had never really been contracted. A wife may now obtain a divorce on the ground of the husband's incestuous adultery; or of his bigamy with adultery; or of rape; or of sodomy; or of adultery coupled with gross cruelty; or of adultery coupled with desertion without reasonable excuse for two years. The husband may obtain a divorce on the ground of the wife's adultery. But neither party can obtain a divorce on the ground of desertion alone, however long continued. Nor will a divorce be granted should it appear that husband or wife has been guilty of recrimination by committing the same offense, or that there is collusion between them in order to procure the divorce. Parties also who have condoned the offense—that is, who after it has been discovered have consented again to live together as husband and wife—will not be allowed to obtain a divorce. In order to guard against fraud by parties conniving to procure a divorce, power is given to the Queen's proctor, by 23 and 24 Vict., c. 144, to interpose, in case he have reasonable ground to suspect collusion or recrimination, in order to oppose a petition for divorce. The court may order the husband to pay a divorced wife a certain sum for her maintenance during their joint lives. After decree of divorce the offending party may marry again, even with the paramour. But it is enacted, 20 and 21 Vict., c. 85, that no clergyman shall be compelled to solemnize the marriage of any person who has been divorced. He must, however, allow another clergyman, if willing to do so, to perform the marriage. By the acts of 1857 and succeeding years, parties are also entitled to obtain a judicial separation on the ground of adultery, cruelty, or desertion. Judicial separation is declared to be in place of a separation *a mensa et thoro*. A married woman, having obtained a decree of judicial separation, is declared to be in all respects as a *feme sole* in regard to any property that she has or may acquire. Even before obtaining a separation, a woman deserted by her husband may obtain from the court a protection for any property she may acquire by her own industry.

In the United States, during the colonial period, the legislative bodies in the several provinces gradually assumed the right of granting divorce, and after the Revolution the system of divorce by legislative enactment became uniformly established. Experience of this system proving its defective character, the jurisdiction over divorce cases was generally transferred to the courts of equity, and in many of the State constitutions it was distinctly provided that divorce by legislative act should not be permitted. There is no national control over divorce legislation in this country, and, as the States are left to make their own laws regulating the dissolution of marriage, the greatest diversity in their treatment of the subject has arisen, some of them refusing divorce altogether, or granting it only for a single cause, and others going to the extreme of laxity in permitting the dissolution of the marriage bond.

This want of uniformity makes it impossible to lay down general principles as to the grounds on which divorce is granted in the United States as a whole, and a brief outline of the laws relating to the subject in the different States is all that can here be attempted. There are laws granting divorce on certain specified grounds in all the commonwealths and territories except South Carolina. In the latter State divorce is not granted on any grounds whatever, either by courts of justice or by legislative acts, and the results of this state of things offer an interesting subject for investigation to those who maintain the strict canonical view with regard to the indissoluble nature of marriage. It has been remarked that the prevalence and partial legal recognition of concubinage are the effects of this attitude toward the divorce question in South Carolina. (Bishop's *Marriage and Divorce.*) In all the other States infidelity and violation of the marriage vow are recognized as valid grounds for divorce. In New York adultery alone warrants absolute divorce in the eye of the law. Impotence or physical inability in almost all States either justifies divorce or renders the marriage voidable. Willful desertion is generally considered a sufficient cause, but the period of absence necessary to substantiate the complaint varies in the different States from one to five years. Other grounds generally recognized are habitual drunkenness; conviction of felony; intolerable, extreme, or repeated cruelty; and continuous desertion. Separation is frequently allowed, and in a few States absolute divorce on the ground of insanity; failure of the husband to provide for the wife; willful neglect for three years; absence without being heard from for three to seven years; separation for five years; reasonable presumption of death by the court; ungovernable temper; cruel treatment, outrages, or excesses, such as render living together intolerable; notorious immorality of the husband before marriage, unknown to the wife; gross misbehavior or wickedness; gross neglect of duty; attempt on life; refusal of the wife to move into the State; three years with any religious sect that believes the marriage relation unlawful; joining such a sect and refusing to cohabit for six months. In many jurisdictions the marriage may be annulled on numerous grounds which prevented it from being validly entered into, such as fraud or mental incapacity at the time of the marriage.

Such are the various grounds on which the marriage tie may be dissolved in the United States; but condonation, or collusion, or connivance, with the purpose of procuring a divorce, is in all States regarded as a bar to the dissolution of marriage. In Georgia, divorce is only granted after the same verdict has been reached by two juries at different terms of the court. In Connecticut, Illinois, Kentucky, and Missouri, the divorced parties may remarry without restriction. In Massachusetts, either party may remarry, but the defendant must wait two years and get the permission of the court. In Virginia a decree of the court may restrain the guilty party from marrying again; and in Maine the parties cannot marry till after two years without the court's permission. In New York, the plaintiff may remarry, but the defendant is not permitted to do so in the former's lifetime except by the express permission of the court, or if, after five years have passed, the plaintiff has remarried, and the defendant's conduct has been uniformly good during the interval. Violation of this rule is punished as bigamy, even when the other party has remarried. In Delaware, Pennsylvania, and Tennessee, the party divorced for infidelity to the marriage vow cannot marry the partner in guilt during the lifetime of the former spouse; nor in Louisiana, at any time, such marriage in the latter State being considered bigamy. From the conflict of laws in various countries on the subject of divorce, questions have frequently arisen as to the competency of a tribunal having power according to the *lex loci* to pronounce sentence of divorce, to annul a marriage contracted elsewhere. In the absence of personal service upon the defendant many States refuse to recognize such divorces with resulting confusion as to questions of bigamy, dower, and legitimacy of children. In the case of Haddock against Haddock, 201 United States Reports 562, it was decided by the Supreme Court in 1906, four justices dissenting after an elaborate discussion, that a divorce granted in a State where the defendant is not domiciled, without personal service of process or a voluntary appearance by the defendant, though valid in the State where decreed, need not be recognized by any other State. The courts will not recognize a transient visit to a foreign country as sufficient ground to sustain a divorce. See CONFLICT OF LAWS; DOMICILE.

STATISTICS. Divorce, in its broader social aspects, can best be introduced by a summary of statistics drawn from various official sources. The report of the Hon. Carroll D. Wright, LL.D., Commissioner of Labor at Washington, is the best single authority. It was made in 1889, and covers the statutory laws and statistics on these subjects for the United States and most European countries for the twenty years 1867-86. The annual reports of eight or nine States only, and of various European countries, give figures for later years. It is expected that Congress will soon make provision for a supplementary investigation.

In the twenty years 1867-86, there were found to have been 328,716 divorces in the United States whose libels or records were discovered. There were 9937 in 1867 and 25,535 in 1886, an increase of 157 per cent. Meanwhile, population probably increased little more than 60 per cent. The figures of a few typical States are cited: Connecticut granted 500 in 1867 and 452 in 1900, being one of the two or three States where the movement seems to be checked. The ratio of divorces to marriages celebrated in 1900 was 1 to 15.4, having been as high as 1 to 8.5. New Hampshire granted 136 in 1867 and 435 in 1899. Rhode Island granted 195 in 1867 and 400 in 1898, or 1 to 8.2 in the latter-named year. Ohio granted 901 in 1867 and 3217 in 1900, or one divorce to 10.9 marriages. Indiana had 1096 in 1867, the largest number for that year in any State, and 1655 in 1886. But in 1900 there were 4699, or one to every 5.7 marriages of the year. Pennsylvania granted 575 in 1867, and 1889 in 1886. Illinois granted 1071 in 1867, and 2606 in 1886. Michigan divorces increased from 449 in 1867 to 1339 in 1886 and 2418 in 1900. The ratio now is probably I to 11. Vermont had 157 in 1867, and, with a slight increase of population, had 233 divorces in 1897. All these States have several statutory grounds of divorce. Changes in the statutes and in the administration of the various county courts in part account for conditions in Vermont and Connecticut, and perhaps one or two other of these States.

New York, which grants divorce for adultery only, and New Jersey, which adds desertion (the most easily abused of all causes, unless it be the former 'omnibus clause' of Connecticut and a few other States), are instructive examples of another kind. New York granted 771 in 1867, and 1006 in 1886, an increase of less than half the increase of population. New Jersey, with its additional and easily misused cause of desertion, granted 60 in 1867, and 286 in 1886, and 292 in 1893. New York, with one cause, and that one difficult of proof, grants 40 per cent. more divorces in proportion to population or to marriages than New Jersey, though the latter adds desertion. The explanation is chiefly in the difference of administration. In New York divorces are granted in each county and city, while in New Jersey divorce cases go to one court—the highest in the State—whose chancellors require written testimony and sift it with great care.

In the West high divorce rates prevail, but are no higher than some already given. The increase of population there is so great that figures are misleading, unless compared with population. A few instances in the South may be cited: From 1867 to 1886 the increase was as follows: Alabama, from 78 to 662; Arkansas, 121 to 646; Kentucky, 292 to 757; Mississippi, 49 to 504; North Carolina, 21 to 163; Tennessee, 287 to 801; Texas, 91 to 1326; Virginia, 90 to 238. South Carolina grants no divorce. In the South as a whole the movement was slow in the first part of the period, but was greatly accelerated later. Unfortunately, no data exist regarding the influence of race and religion upon divorce in this country. Technically 20 per cent. of all the divorces in the United States were granted for adultery; 38 per cent. for desertion; 16 per cent. for cruelty; 4 per cent. for drunkenness; and so on. But these figures are of little value as indications of the real causes. Better, in reference to intemperance, is the result of a special examination of 29,665 divorces in 45 representative counties. This discovered intemperance as a direct or indirect cause of 20.1 per cent. of the whole number. The length of married life before divorce averaged 9.17 years—a little shorter than the period of some European countries. The wife is the applicant in about two-thirds of the cases—often, it should be noted, as a personal convenience to the parties. From two-thirds to four-fifths of the applications appear to be granted. Out of 289,546 divorces whose places of marriage were known, 80.1 per cent. were granted in the State where the parties had been married, notwithstanding the fact that on the average over nine years had elapsed between marriage and divorce, and that somewhat less than that per cent. of the population were living in the State of their birth. This shows that migratory divorces, though many in number, are a very small part of the entire number granted in the country. The abuse of our conflicting laws and the uncertainty to which they expose our people are very serious. But the real gravity of the situation is in the almost universal prevalence of divorce in all parts of the country, both in city and rural communities, though generally somewhat less in the latter than in the former.

Apparently more divorces in this country occur in families where there are very few or no children, and at the other extreme, where children are very numerous. The latter fact is due probably to the desertion by fathers of large families among the lower classes. One or two States check this by statutes making culpable neglect to support one's family a misdemeanor.

European figures are also instructive. Divorces or separations—the latter chiefly in Catholic countries—are as follows: Austria granted 883 in 1891, and 2033 in 1903; Belgium 130 in 1867, and 703 in 1902; France, 2181 in 1867, and 2806 in 1882. In 1885, the first full year under the law of 1884, there were 6245, 7460 in 1897, and 8431 in 1902. England and Wales granted 130 in 1867, and 398 in 1891; Scotland, 32 in 1867, and 96 in 1886. The German Empire granted 3942 in 1881, and 6878 in 1897; Prussia granted 2329 in 1881, 5699 annually during the period 1895-99, and 5981 in 1903; Bavaria granted 270 in 1867, and 308 in 1891; Saxony, 396 in 1867, and 935 in 1893; Baden, 19 in 1867, 143 in 1886, and 261 in 1903, the average for the period 1894-1903 being 210; Hamburg, 145 in 1880, and 287 in 1886; Württemberg, 94 in 1867, and 153 in 1892. In Italy the movement fluctuated a good deal from year to year. In 1891 there were 591 divorces. In the Netherlands there were 133 divorces in 1867, and 474 in 1892. Norway granted 33 in 1870, and 71 in 1890. Sweden granted 128 in 1867, and 313 in 1892. Rumania granted 276 in 1871, and 762 in 1890. Switzerland, in six cantons, granted 190 in 1867, and 287 in 1875. The next year, under the uniform Federal law, the same cantons granted 444, and 396 in 1886. In the entire country, under a uniform law, there were 1102 in 1876; 1036 for each of the two following years; there were less than 900 on the average until 1896, when they rose to 1058, being 1018 in 1898. The ratio to marriage is generally about 1 to 22, being the highest of any country in Europe, and about the same as in Massachusetts. In Russia there were 892 divorces in 1867, and 1196 in 1885, among the Orthodox; 147 in 1867, among those of the Evangelical Augsburg Confession, and 188 in 1886. All divorces in Poland numbered 163 in 1867, and 345 in 1886. Fully three-fourths of these were among Jews.

Divorces in Canada are very few, there being only 19 in 1904. Of these, 8 were granted in Nova Scotia and New Brunswick, where the courts and not the legislative bodies have jurisdiction of the subject. In Australia there were 140 divorces in 1890, 340 in 1896, and 394 in 1902. New Zealand granted 16 in 1884, 25 in 1893, and 91 in 1902. For Australasia, including New Zealand, there were 518 divorces and 33 separations during the period 1886-90, and 2986 divorces and 148 separations during the period 1896-1902. In Japan the divorces for several years are about one-third the marriages. Until recently public law there exercised no control over marriage and divorce, these being left to the families immediately concerned. As a rule the divorce rate in the United States is several times greater than in Europe. There are courts of divorce in all of the nearly three thousand counties in the United States, except in South Carolina and New Jersey. A single divorce court exists in England; one in each of the twenty-eight judicial districts of Germany, while there is one in each of the seventy-nine departments of France. The presence of several statutory grounds for divorce and their phraseology, rather than the technical number of causes, and the practice of the courts in regard to their interpretation, affect the number granted. The prevailing local sentiment may, perhaps, be considered a still more influential factor in determining the number.

The strong legislative movement for greater freedom of divorce of the past century has been succeeded in many jurisdictions by a somewhat reactionary tendency. This appears in the removal of the "omnibus clause"—that giving general discretion to the courts to act beyond the definitive statutes—from the statutes of Connecticut and other States; in the raising of the period of residence from three to six months to one or more years in several States and all the Territories; in requiring a period of six months or more to intervene between the granting of the decree and its final issue to the parties; and in striking out all grounds for divorce in the District of Columbia except one. The imperial law of 1900 in Germany reduces the causes to about four. It prevents the abuse of desertion by requiring, before a decree is granted, a preliminary suit for the restitution of conjugal rights, and allows a year for the accomplishment of this object. Improved marriage laws have also helped in the matter of divorce.

Uniform Laws. The problem of uniformity took on a new aspect on the appearance of the Government report of 1889 and the discussion that preceded and followed. The value of national legislation, under constitutional amendment, in restricting the number of divorces, it was then seen, might be very small. The obstacles in the way of getting three-fourths of the States to consent to it, and of enforcing it in localities where public sentiment would be hostile, appeared very great. Then the transfer of the care of marriage and divorce to the Federal authorities or to State regulation under Federal provision, with its effect on laws of inheritance and the like, and upon our present system of division of powers between the Federal and State governments, open many serious and difficult questions. Consequently, most thoughtful students of the problem have felt that the present experiment, in which thirty-four States and Territories are already represented, of trying to secure uniformity by enacting the bills their commissionaries on uniformity prepare and recommend, should have fair trial as the better way at present of either gaining all that can be accomplished or of preparing for the constitutional amendment itself, should that be found necessary.

The Broader Social Movement. It is evident that there is a profound and widespread social movement going on beneath the great variety of law, religion, and other conditions through which this movement finds expression, and which is most marked in the United States. Some remarks on this broader movement and its recent treatment will, perhaps, best set forth the subject in its outlines.

Until recent years, and even now, divorce is treated chiefly in its legal or ecclesiastical phases. This treatment has also been individualistic to a great degree. That is, both Church and State have regarded chiefly the two individuals directly concerned, with some consideration of the interests of the Church or State. But the family has been relatively overlooked. The canon law, the writings of the early fathers, and, in fact, the great body of literature on the subject, are singularly lacking in direct attention to the family as the real subject in the discussion of divorce. The term marriage has been used to cover both the creative agreement in marriage and the subsequent relation. Two views of the relation and its dissolution grow out of this. One makes the relation a mere contract from beginning to end, and therefore subject to all the remedies of ordinary contracts. The other insists that a *status* is created by the original contract, and that it is this *status* or relation with which divorce deals, sometimes calling it, as Bishop and others have done, "a contract *sui generis*," or "a state of matrimony." But very infrequently is this called a family, thus in reality making divorce the legal dissolution of a family instead of individual relief from a contract. Some conservative people have said that marriage, after all, is only a *modus vivendi*.

An interminable discussion has gone on over the technical meaning of the New Testament, in order to fix the rules of ecclesiastical practice. The Roman Catholic Church has held to a consistent course in its ecclesiastical discipline; but has generally been compelled to share its control of divorce in recent times, in the more progressive countries, with the State. In Russia the Orthodox Greek Church and other confessions are allowed to administer, in all affairs of marriage and divorce, according to their own rules. Austrian law also adjusts itself to the different faiths of its subjects. And divorce laws, in their grounds for divorce, usually follow the religious opinions of the people. The obligatory civil marriage, with an optional religious celebration, prevails in several European countries.

The condition of what may be called the sociological strata of a period or country helps to shape the customs or laws of marriage and divorce. Among the early peoples of the Mediterranean, these subjects were entirely within the control of the families immediately concerned, as in Japan until recently. The three kinds of Roman marriage were the expression of as many types in Roman society. As the early family yields more and more of social function to the State, the individual and relations of contract gradually supplant the family and those of *status*. All intermediary social forms, especially those of the domestic and communal type, tend to shrivel and lose their functions. Historically the increase and prominence of divorce have marked decaying civilizations. Whether the increase of the last thirty years will continue in the United States remains to be seen. There is an element of truth in the claim that the increase of divorce is in one sense the incident of social health. This rests, however, on certain assumptions concerning those who seek divorce which are of limited application.

Christianity came when the Roman world was far along in social disintegration. Its Founder said very little about institutions. Even Church, State, and family were left by Him to the development of the great principles which He set forth. It may be doubted if He ever legislated or intended that His utterances should be taken as legislation, even for His Church. Early Christianity necessarily sought men as individuals, and dealt with them as such. Marriage, divorce, celibacy, chastity were all considered chiefly with regard to their effect on individual well-being. Their social, institutional bearings were ignored, unless it was in respect to the Church. The family is hardly named in the canon law, which was cast in the matrix of Roman law when in its later stages of individualism, in the regulations of Protestant churches. The emphasis of the Reformation on the individual, the art of printing, the use of gunpowder, the beginnings of modern science, and the discovery of America all increased the power of the individual. Later, the ethical and political theories of Grotius, Hobbes, Locke, Rousseau, Blackstone, and Jefferson, the earlier schools of political economy, the American and French Revolutions, the rise of the modern industrial system, and still later the use of steam and electricity, have all done much to accelerate those changes by which the individual and the largest social combinations have absorbed the attention of society at the expense of all domestic and commercial groups. The evangelistic work of the last century, the temperance and the antislavery reforms, and the advancement of woman through assertion of her rights, should also, for similar reasons, be named as directly or indirectly contributory to the increase of divorce. That the general result is good as a whole may be fully conceded without denying the incidental evils. The increase of divorce and changing opinions and practice regarding marriage and other incidents of the family, in this light seem to be the result of changes in the constitution of Western civilization. How far the disintegration and reconstruction of families is consistent with the health and growth of the social body has become a question of first importance in social science.

CHANGE OF TREATMENT. The growth of social science, especially in the form of sociology taken in relation to the social sciences, much as biology is related to its kindred sciences, is gradually but surely changing the discussion of divorce. For from this point of approach it is soon perceived that the family is the real object of study, and that marriage and divorce, as well as other of its incidents, are acts formative or destructive of the family. This puts the subject on a new ground. Historical sociology reveals the place of the family, and with it that of property, a subject always wrapped up with that of the family in early society, and in the development of civilization in all its more important phases. The scientific analysis of the present social order shows how the monogamous family embodied in the home has become to the social structure what the cell is to the human body. For the question of divorce compels us to ask: "What is marriage? What is the family? How far does the family, in its structure and principles, enter into the national constitution of a people? Can we hold to theories of the family which we have repudiated in our treatment of the State? Are the family and Church and State of the same nature? Can democracy be allowed to go to the extreme of individualism, and end in the dissolution of the State and the family by mutual consent?" Most of the discussions of former years in religious circles in this country, and even now, have not got much beyond the old method of the treatment of divorce as the chief concern of two individuals, through the application of the precepts of individual morality. The different religious bodies have busied themselves with their respective tenets regarding the number of justifiable grounds for divorce and the practice allowable under them, many assuming that the Founder of Christianity legislated on the subject for His Church, or perhaps for both Church and State. These things are being reiterated with much vehemence in many quarters. They strengthen many in the old faith, and probably convert some others to it.

But the scientific study of society which has come about and rapidly spread in our higher educational institutions within the last twenty-five years, and the modern methods of biblical interpretation, have combined to force considerable change already. In some quarters at least the method of threshing over the old ground with grammar and lexicon, with the addition of mere archæological information, is giving way, and attention is turning to the underlying social factors in the problem. The chapters on "The Family," in Prof. Shailer Matthews's *Social Teaching of Jesus*, and in Prof. Francis G. Peabody's *Jesus Christ and the Social Question*, with some recent books on social ethics, may be cited in evidence of a change that is going on in the method of treatment by which the family has come to the front, both in scientific and religious circles, and marriage and divorce made its incidents rather than treated as separate subjects. It is too early to predict definite results, though the movement is one of much promise.

The chief recent periods of discussion are as follows: In England, over the Divorce Law, by Mr. Gladstone and others in 1857; in Connecticut, in 1866-69, when President Woolsey, of Yale, and Professor Hovey, of Newton Theological Seminary, published small volumes on the subject; in Switzerland, in 1875, when a Federal law was enacted; in France, over the law of 1884, by M. Bertillon, M. Naquet, and others; in New South Wales, over the law of 1892, by Sir Alfred Stephen; in Japan, about the same time, when divorce first came under the control of the State; and in Germany, when an imperial law went into effect, January 1, 1900. The discussion in the United States was renewed in 1878. The society now known as the National League for the Protection of the Family (Rev. Samuel W. Dike, LL.D., Auburndale, Mass., secretary) has had an important part in the discussion of this period.

BIBLIOGRAPHY. Foote, *Divorce: a Review of the Subject from a Scientific Standpoint* (New York, 1884); Lee, *Historical Jurisprudence* (ib., 1900); Schouler, *Treatise on the Law of Domestic Relation* (5th ed., Boston, 1895); Lehr, *Le mariage, le divorce et la séparation de corps dans les principaux peuples civilisés* (Paris, 1899); Stephen, *Commentaries on the Laws of England* (14th ed., London, 1903); Bryce, *Essays in History and Jurisprudence* (Oxford, 1901); Bertillon, *Etude démographique du divorce* (Paris, 1883); Fulton, *Marriage and Divorce* (Philadelphia, 1898); Bolo, *Du mariage au divorce* (Paris, 1896); Convers, *Marriage and Divorce in the United States* (Philadelphia, 1889); Hugnet, *Des effets du divorce* (Paris, 1901); Westbrook, *Marriage and Divorce* (Philadelphia, 1883); Willcox, *The Divorce Problem* (New York, 1897); Dixon, *Law, Practice, and Procedure in Divorce and Other Matrimonial Causes* (3d ed., London, 1900); Bingham, *Christian Marriage* (New York, 1900); Evans, *Treatise on the Christian Doctrine of Marriage* (New York, 1870); Snyder, *Geography of Marriage* (New York, 1899); Thwing, *The Family* (Boston, 1887); Howard, *A History of Matrimonial Institutions* (Chicago, 1904); Bryce, *Marriage and Divorce* Oxford, 1905); Keezer, *Law of Marriage and Divorce* (Boston, 1906); Wright, *Report on Marriage and Divorce in the United States* (Washington, 1889); the report of the Committee of the National Council of Congregational Churches (1898). See Proceedings of the General Convention of the Protestant Episcopal Church (1901). See also MARRIAGE; HUSBAND AND WIFE.

DIX, DOROTHEA LYNDE (1805-87). An American philanthropist, and writer of juvenile books, born at Worcester, Mass. She was noted for her interest in the unfortunate and criminal classes. During the Civil War she was superintendent of hospital nurses. In the course of labors to improve the condition of paupers, lunatics, and prisoners, she visited every State east of the Rocky Mountains, and procured ameliorative legislation in many of them. She published: *The Garland of Flora* (1829); *Prisons and Prison Discipline* (1845); and a great number of memorials on philanthropic subjects. Of many books for children, *Conversations About Common Things* and *Alice and Ruth* are typical.

DIX, John Adams (1798-1879). An American statesman and soldier, born at Boscawen, N. H. He entered the army as a cadet in 1812, served on the Canada frontier throughout the War of 1812, and in 1819 became the aide of General Brown, then commanding the Northern Department. In 1826 he was sent on a special mission to Denmark, and in 1828 resigned his commission (of captain) to study and practice law in Cooperstown, N. Y. He soon became prominent in politics, and was Adjutant-General of New York from 1830 to 1833, and Secretary of State and Superintendent of Common Schools from 1833 to 1840, besides being a prominent member of the 'Albany Regency' (q.v.). He was chosen a member of the Assembly in 1842, and from 1845 to 1849 was a member of the United States Senate. In 1848, when the Democratic Party divided on the question of the extension of slavery, he went with the Free-Soil wing, and was their candidate for Governor, but was not elected. From January to March, 1861, he was Secretary of the Treasury under President Buchanan, and as such endeavored to have all the revenue cutters in Southern harbors sent north before the beginning of hostilities. Among these, two cutters from New Orleans were ordered to New York. The captain of one of them refused to obey the order, and Dix immediately telegraphed to have him arrested and treated as a mutineer if he offered any resistance, closing the dispatch with the words: "If any man attempts to haul down the American flag, shoot him on the spot." In 1861 Dix was appointed major-general of United States Volunteers, and was placed in command of the Department of Maryland. In May, 1862, he was sent to Fortress Monroe, and immediately after the New York draft riots (q.v.), in July, 1863, was sent to New York to command the Department of the East, which position he retained until July, 1865, when he returned to civil life. Subsequently he was Minister to France from 1866 to 1869, and from 1873 to 1875 was Governor of New York. Besides miscellaneous papers, he was the author of *Resources of the City of New York* (1827); *Decisions of the Superintendents of Common Schools of New York, and Laws Relating to Common Schools* (1837); *A Winter in Madeira and a Summer in Spain and Florence* (1850); and *Speeches and Occasional Addresses* (1864). Consult Morgan Dix, *Memoirs of John A. Dix* (New York, 1883).

DIX, Morgan (1827—). An eminent American clergyman, the son of Gen. John A. Dix. He was born in New York City, and graduated at Columbia in 1848 and at the General Theological Seminary in 1852. Three years later he became assistant minister of Trinity Church, New York, and in 1862 became the rector of the parish. His life has been marked by great zeal in religious work and by fearlessness in attacking the vices of society. He was, in a number of successive General Conventions of the Episcopal Church, elected without opposition as president of the House of Clerical and Lay Deputies, an honor which advancing age compelled him to decline in 1901. He has published, among other works: *A Commentary on the Epistle to the Romans* (1864); *An Exposition of the Epistles to the Galatians and Colossians* (1865); *Lectures on the Pantheistic Idea of an Impersonal Substance Deity* (1865); *Lectures on the Two Estates* (1872); *Memoirs of John A. Dix* (1883); *Gospel and Philosophy* (1886); *The Sacramental System* (1893); and *A History of the Parish of Trinity Church*, 4 vols. (1898-1906).

DIX'EY, Henry E. (1859—). An American comedian. He was born in Boston, and at the age of nine years became a member there of the Howard Athenæum Company, taking the part of Peanuts in *Under the Gaslight*. His subsequent experience included rôles in *Cinderella at School; The Mascot; Pinafore;* and a great variety of other plays. In 1883 he was engaged at the Bijou Theatre, New York, in *Adonis*, the character in which he made his greatest reputation. In 1894 he became a member of Daly's company for a season. Of his later performances, the most noteworthy is his creation of David Garrick in Stuart Robson's production of *Oliver Goldsmith* (1900).

DIX'IE. (1) A Northern ballad of the Civil War, by T. M. Cooley. (2) A very popular ballad, by D. D. Emmett (1859), originating with Bryant's minstrels in New York, and first performed at Mechanics' Hall. It was appropriated by the South, and became one of the great Confederate battle songs of the Civil War. (3) A Confederate war ballad of the Civil War, by Albert Pike (1861), which first appeared in the Natchez *Courier*. See Dixie's Land.

DIXIE, Lady Florence Caroline Douglas (1857-1905). An English explorer, writer, and champion of woman's rights. She was born in London, the daughter of the seventh Marquis of Queensberry, and married Sir Alexander Beaumont Churchill Dixie, Bart., in 1875. She spent some time in Patagonia in 1878-79, and described her travels in a volume entitled *Across Patagonia* (1880). She was a correspondent of the *Morning Post* of London, during the Boer War of 1880-81, and afterwards published: *Defense of Zululand* (1882); *In the Land of Misfortune* (1882); *Gloriana* (1893); and *The New Woman* (1896).

DIXIE'S LAND, or **DIXIE.** A term applied to the Southern States. Its derivation is obscure. It is said to have originated in New York, where a certain Dixie owned a large number of slaves. The latter, when obliged to migrate to the South, grew to look upon their old home as a sort of paradise, which they celebrated in their songs. In time the term Dixie's Land was transferred to their new homes, and so became a name for the South among the whites as well as the negroes. The term is also popularly connected with Mason and Dixon's Line—the line of division between the free and the slave States—and is said to have been first used of Texas when that State joined the Union.

DIX'ON. A city and county-seat of Lee County, Ill., 98 miles west of Chicago, on Rock River, and on the Chicago and Northwestern and the Illinois Central railroads (Map: Illinois, C 2). It is the seat of the Northern Illinois

Normal School (private) and of the Rock River Military Academy. It manufactures condensed milk, shoes, plows, wagons, screens, etc. Dixon, settled in 1836, is governed under a revised charter of 1869, by a mayor and a unicameral council. Pop., 1900, 7917; 1906 (local census), 10,000.

DIXON, James Main (1856—). An American teacher and author, born at Paisley, Scotland. He graduated at Saint Andrews University in 1879, and was appointed Tyndall Bruce scholar and tutor of philosophy at the university in the same year. He was professor of English and secretary of the Imperial College of Engineering, Tokio, Japan, from 1879 to 1886, when he was called to the Imperial University of Japan in the same capacity. From 1892 to 1901 he was professor of English Literature at Washington University, Saint Louis, Mo. For one year (1903-4) he was president of Columbia College, Milton, Oregon. He compiled a *Dictionary of Idiomatic English Phrases* (1891).

DIXON, Joseph (1799-1869). An American inventor. He made important improvements in photography, lithography, bank-note printing, steel smelting, and lens-grinding. He was by turns a shoemaker, printer, lithographer, wood-engraver and physician, and gained wealth from his crucible works, established at Salem, Mass., in 1827, and removed to Jersey City in 1847.

DIXON, Richard Watson (1833-1901). An English poet and historian, born in London and educated at Oxford. He became honorary canon of Carlisle in 1874, vicar of Hayton, in Cumberland, in 1875, and vicar of Warkworth, in Northumberland, in 1883. His poetical works include: *Mano: A Poetical History in Four Books* (1883); *Odes and Eclogues* (1884); *Lyrical Poems* (1886); *The Story of Eudocia and Her Brothers* (1888); *Songs and Odes* (1896); *Last Poems* (1905). His most celebrated poetic productions are the odes entitled: *On Conflicting Claims; On Advancing Age;* and *The Spirit Wooed.* His best title to fame, however, rests upon the *History of the Church of England from the Abolition of the Roman Jurisdiction* (6 vols., 1877-1902).

DIXON, Thomas, Jr. (1864—). An American author and lecturer, born at Shelby, N. C., and graduated at Wake Forest College, N. C., in 1883. He served in the North Carolina Legislature until 1886, when he entered the Baptist ministry, filling pastorships in Raleigh, N. C. (1887), Boston (1888-89), and New York (1889-99). Thereafter he lectured. He wrote *The Leopard's Spots* (1902), *The One Woman* (1903), *The Clansman* (1905). His treatment of the negro question in these books and in the dramatization of *The Clansman* was bitterly assailed.

DIXON, William Hepworth (1821-79). An English writer and traveler. He was born in Manchester. He became a contributor to the *Athenæum* and the *Daily News.* His first book was *John Howard and the Prison World of Europe* (1849). In 1851 appeared his *Life of William Penn.* Two years later appeared his anonymous pamphlet, *The French in England.* From 1853 to 1869 he was editor of the *Athenæum.* Among his other writings are: *The Personal History of Lord Bacon, from Unpublished Papers* (1861); *The Holy Lady* (1863); *New America* (1867); *Spiritual Wives* (1868); *Free Russia* (1870); *The Switzers* (1872); *History of Two Queens* (1873-74); *White Conquest* (1875); *British Cyprus* (1879).

DIXON ENTRANCE. A strait on the west coast of North America, separating Prince of Wales Island and others of the archipelago off the south arm of Alaska from Queen Charlotte Island on the south (Map: British Columbia, B 4). It divides, in this quarter, the British possessions and those of the United States. The strait is about 100 miles long, from east to west, and 70 miles wide, and connects the Pacific with Hecate Strait on the east.

DIX′WELL, John (1608-89). One of the three judges of Charles I. who took refuge in America. He took an active part in the English Revolution as a colonel in the Parliamentary Army, was a member of Parliament for several years, and was one of the court which condemned Charles I. to death. After the accession of Charles II. he fled from England to save his life, and, under the name of John Davids, lived for many years undiscovered in America, for the most part at New Haven, Conn. Consult Stiles, *History of Three of the Judges of Charles I.—Whalley, Goffe, and Dixwell* (Hartford, 1794).

DIZFUL, dėz-fo͞ol′ (Pers., Dis Bridge). A town of Persia, the capital and principal mart of the Province of Khuzistan, situated on the river Dis, about 200 miles west of Ispahan (Map: Persia, C 5). The river is crossed by a handsome bridge of twenty arches, and the town contains a large number of mosques, schools, and baths, some of them in ruins. The chief article of commerce is indigo. The population is estimated at from 16,000 to 28,000.

DJEZZAR, jĕz′zȧr (Ar. *jazzār*, butcher, tyrant, from *jazara*, to slaughter) (c.1735-1804). A nickname denoting butcher, given to Achmet Pasha, who was celebrated for his obstinate defense of Acre against Napoleon. He was born in Bosnia, of Christian parents, but turned Mussulman, entered the service of Ali Bey, with whom he occupied the position of chief assassin, and rose, through murder and treason, from the condition of a slave to the Pashalic of Acre. In 1799 he held Acre against Napoleon for two months, and forced him to abandon the siege. Stories are extant of his fiendish cruelty, but they are probably exaggerations. As a ruler and man of affairs he was exceedingly capable.

DJINNESTAN, jĭn′nė-stän′, or **JINNESTAN.** The mythical land of the Djinns or Jinns, the Oriental genii or fairies.

DJOWF, jouf. See Jowf.

DLUGOSZ, dlo͞o′gôsh, Jan (Lat. Longinus) (1415-80). A Polish historian. He was born at Brzeznica, and was educated at the University of Cracow. As the protégé of Bishop Fbygniew of Cracow, and of King Casimir of Poland, he was sent on important diplomatic missions to the Pope and also to Hungary, Bohemia, and several other countries. He conducted the education of the King's sons, and instituted many pious and charitable endowments for university students. The publication that made him famous is the *Historia Polonica* (12 vols., 1455-80), which comprises a complete history of Poland to the date of publication, and is characterized by a spirit of noble patriotism and by indefatigable research.

DNIEPER, nē′pēr, *Russ. pron.* dnyĕp′ĕr. A river of Russia, the largest in Europe with the exception of the Volga and the Danube (Map: Russia, D 5). It takes its rise in the swamps of the Government of Smolensk, and, after leaving that government, flows in a southern direction as far as Kiev. At that city it turns southeast, and maintains that direction down to Ekaterinoslav, where it again turns to the south. In this part of the river the banks are rocky and elevated, and the river forms its famous rapids, which can be passed only at full tide and with the assistance of experienced pilots. Below Alexandrovsk the Dnieper assumes a southwestern course, emptying into the Black Sea below Kherson, where it forms a wide estuary, known as the Dnieper Liman. The total length of the river is over 1400 miles.

It is navigable for nearly its entire length, and is of great commercial importance. Its chief tributaries are the Beresina, Pripet, and Ingulets from the right, and the Soj and Desna from the left. The basin of the river is estimated at 200.000 square miles, almost entirely within the boundaries of Russia. The waters of the Dnieper abound in fish. There is steam navigation from Orsha, in the northern part of the Government of Mohilev, to Ekaterinoslav, and from Alexandrovsk, below the rapids, to Kherson. The freight carried on the Dnieper consists principally of grain and lumber, and has an annual value of about $40,000,000. The Dnieper communicates with the Baltic Sea through the Beresina Canal, which connects the Beresina with the Dvina, the Oginski Canal connecting indirectly the Pripet, a tributary of the Dnieper, with the Niemen, and the Dnieper-Bug Canal, connecting the Pripet with a tributary of the Vistula. In its upper course the Dnieper is usually frozen over from December to April, while at Kherson, near the mouth, it is ice-bound for only two months, from January to March. In ancient times the Dnieper was known as the Boristhenes or Danapris.

DNIESTER, nē′stĕr, *Russ. pron.* dnyĕs′tĕr. A river of southern Europe, rising in the Carpathian Mountains, near Sambor, in the Austrian Crownland of Galicia (Map: Russia, C 5). It flows in a southeastern direction through Galicia, and enters Russian territory near Khotin, Bessarabia. Its course through Russia, where it separates Bessarabia from Podolia and Kherson, is very tortuous, but has a general southeastern direction. It empties into the Black Sea between Ovidiopol and Akkerman, forming the Dniester Liman, a shallow sheet of water about 20 miles long and 5 miles wide. The total length of the river exceeds 850 miles, of which over 500 is in Russia. The Dniester runs mostly through an elevated country. At Yampol rapids formerly interfered with navigation, but they have been partly overcome, and steam navigation begins at Khotin. The chief tributaries of the Dniester are the Stry from the right and the Sereth from the left. The Dniester is rich in fish. Its commercial importance has been much increased owing to improvements introduced by the Russian Government. The chief articles of traffic are grain and lumber. In ancient times the Dniester was known as the Tyras or Danaster.

DOAB, dō-äb′ *or* do͞o-äb′ (from Pers. *du*, two +*ab*, water). A word applied, in Hindu countries, like the Greek *mesopotamia* to any region between two rivers. When introduced, however, without local reference of any kind, the Doab means the land inclosed by the Jumna on the southwest and the Ganges on the northeast—a district extending from Allahabad to the base of the Himalayas, a distance of upward of 500, with an average breadth of 55 miles. The fertility of this region has been much increased by the Ganges Canal (q.v.).

DOAK, dōk, SAMUEL (1749-1830). An American clergyman and educator, a pioneer in the movement for the immediate abolition of slavery in the United States. He was born in Augusta County, Va.; graduated at Princeton in 1775; studied theology; and was licensed to preach in 1777. He then migrated to the Holston Valley, and later to Salem, Tenn., where he established an academy which subsequently grew into Washington College, of which he was president from 1795 to 1818. In 1818 he removed to Bethel, Tenn., where he helped to establish and conduct Tusculum Academy, which, in 1844, became Tusculum College. In allusion to his remarkable influence, particularly in religious affairs, among the pioneer settlers of East Tennessee, he was generally known as 'the Presbyterian Bishop.' He early became convinced of the iniquity of slavery, freed his own slaves in 1818, and during the rest of his life, both as a preacher and as a teacher, used the whole of his powerful influence to further the cause of immediate abolition. He is frequently referred to as 'the apostle of learning and religion in the West.' A sketch of his life is given in vol. iii. of Sprague's *Annals of the American Pulpit* (New York, 1857).

DOANE, dōn, GEORGE WASHINGTON (1799-1859). An eminent American clergyman of the Protestant Episcopal Church. He was born in Trenton, N. J.; graduated at Union College in 1818; studied in the General Theological Seminary, and was ordained as a deacon in 1821, and as a priest in 1823. For three years he was the assistant of Bishop Hobart in Trinity Church, New York. He was then successively assistant minister and rector of Trinity Church, Boston, until 1832, when he was elected Bishop of New Jersey. His interest in Christian education soon led him to establish Saint Mary's Hall for Girls at Burlington, N. J., and in 1846 a school in the same town for boys. He published a volume of poems entitled *Songs by the Way* (1824), besides many familiar hymns, among them "Softly Now the Light of Day." Consult *The Life and Writings of George W. Doane* (4 vols., New York, 1860-61), edited by his son, Bishop W. C. Doane.

DOANE, WILLIAM CROSWELL (1832—). An eminent American clergyman of the Protestant Episcopal Church, the first Episcopal Bishop of Albany. He was born in Boston, and graduated from Burlington College, New Jersey, in 1850. Six years later he was ordained priest by his father, Bishop G. W. Doane, whom he assisted in Saint Mary's Church, Burlington. Afterwards he became rector of Saint John's, Hartford, Conn., and of Saint Peter's, Albany, N. Y. In 1869 he was consecrated Bishop of Albany. He organized the Cathedral of All Saints in Albany, and founded Saint Agnes's School for Girls. In 1902 Bishop Doane was chosen Chancellor of the Regents of the University of the State of New York.

He has published: *Mosaics, or The Harmony of the Collects; Epistles and Gospels for the Sundays of the Year* (1881); and *Rhymes from Time to Time* (1901).

DÖBBELIN, dĕb′be-lēn. See Döbelin, Karl T.

DOB′BIN, Major William. An estimable but awkward young officer in Thackeray's *Vanity Fair;* a friend and would-be adviser of George Osborne and his wife, Amelia, whom he finally marries, ten years after her first husband's death.

DOBBS FERRY. A village in Westchester County, N. Y., 21 miles north of the Grand Central Depot, New York City, on the Hudson River, and on the New York Central and Hudson River Railroad. It is picturesquely situated at the south end of the broad expansion of the Hudson known as Tappan Bay, and has handsome residences of New York merchants. Dobbs Ferry's history in connection with the Revolution is interesting. Here, in the old Livingston mansion, Washington and Rochambeau planned the Yorktown campaign; the same mansion is famous for the conference of Washington, Clinton, and Carleton in 1783; and opposite this point was fired the first salute to the American flag by a British sloop of war. Population, 1890, 2083; 1900, 2888; 1905, 3515.

DÖBELIN, dē′be-lēn, Karl Theodor (1727-93). A German actor, born at Königsberg (East Prussia). He studied at Halle and Leipzig, and in 1756 established at Erfurt his own dramatic company. From 1758 to 1789 he was a member of several companies, and subsequently laid the foundations of the Court theatre in Berlin. He did much to promote the presentation of the dramas of Lessing.

DOBELL′, Sydney Thompson (1824-74). An English poet, born at Cranbrook, Kent. His father, who was a wine merchant, removed to Cheltenham in 1836, and Dobell was educated there by private tutors and by himself. In 1844 he married, and, owing to his own ill health or his wife's, made many tours abroad, living for three years in Edinburgh and the Highlands, and finally making his home among the Cotswold Hills, where he died. His poems comprise: *The Roman* (1850); *Balder* (1854); *Sonnets on the War,* written in conjunction with Alexander Smith (1855); and *England in Time of War* (1856). Dobell belongs to the so-called 'spasmodic' school of poets, of whom the extreme type was P. J. Bailey (q.v.). He possessed the true poet's spirit, but was weak in execution. He was a reputable critic and a man of lofty character. Consult: His *Poetical Works,* with a memoir by J. Nichol, published in two volumes (London, 1875); *Thoughts on Art, Philosophy, and Religion,* edited by Nichol (London, 1876); and his *Life and Letters,* edited by Jolly (London, 1878). See Poetry, Spasmodic School of.

DÖBELN, dē′bĕln. A town in the Kingdom of Saxony, situated partly on an island in the Freiberger Mulde, 42 miles southeast of Leipzig (Map: Germany, E 3). Döbeln is a pretty and thriving place, and has manufactures of woolen yarns, iron, wagons, cloth, leather, and agricultural implements. It has an active trade in cereals. Population, in 1890, 13,900; in 1900, 17,745; in 1905, 18,908.

DÖBEREINER, dē′bĕr-ī′nĕr, Johann Wolfgang (1780-1849). A German chemist, born near Hof (Bavaria). He studied pharmacy at Münchberg, and in 1810 was appointed professor of chemistry and pharmacy at Jena. Goethe and the Grand Duke Karl August of Saxe-Weimar were his friends, and the *Briefe des Grossherzogs Karl August und Goethes an Döbereiner* were published at Weimar in 1856 (ed. by O. Schade). He is best known as the inventor of 'Döbereiner's lamp,' considerably used previous to the introduction of sulphur matches. In this apparatus a platinum sponge upon which a jet of hydrogen is directed becomes red-hot and ignites the gas. His publications include: *Zur pneumatischen Chemie* (1821-25); *Zur Chemie des Platins* (1836); and other works. Consult Kragenberg, *Die Bedeutung Döbereiners* (Jena, 1862).

DOBLHOFF-DIER, dŏ′bl′-hŏff-dēr, Anton, Baron (1800-72). An Austrian statesman. He was a member of the Assembly of Lower Austria, and in this capacity revealed himself as a man of decidedly liberal and progressive views. In May, 1848, he was appointed Minister of Commerce, and two months later accepted the portfolios of the interior and of education. In 1849 he was appointed Minister to The Hague.

DOB′NER, Gelasius (1719-90). A Bohemian historian. He was born at Prague, where he was appointed royal historiographer because of his original researches into the domain of Bohemian history. The Bohemian Society of Sciences erected a monument to his memory. His own, as well as the numerous treatises published by the society mentioned, still have considerable scientific value. His principal publications are: *Wenceslai Hagek a Liboczan Annales Bohemorum e Bohemica Editione Latine Redditi et Notis Illustrati* (6 vols., 1761-83), and *Monumenta Historica Bohemiæ nusquam ante hac Edita* (6 vols., ib., 1764-86). Dobner has been called the founder of Bohemian historiography.

DOBREE′, Peter Paul (1782-1825). An English classical scholar, born in the island of Guernsey. He graduated at Trinity College, Cambridge, in 1804, was appointed fellow of Trinity in 1806, and in 1823 was appointed regius professor of Greek. He devoted himself to the classics and enjoyed the intimate friendship of Porson, whose notes on *Aristophanes* he published in 1820 with an edition of the *Plutus;* in 1822 he edited Photius's *Lexicon* after Porson's notes. His notes on various Greek and Latin authors were published in 1831-33, under the title *Adversaria,* to which a small volume was added in 1834-35. Consult Luard, in *Dictionary of National Biography,* xv. (London, 1888).

DOBRITCH, a town of Bulgaria. See Bazarjik.

DOBROVSKÝ, dô-brŏv′skē, Josef (1753-1829). A Bohemian writer, the 'patriarch of Slavonic philology.' He was born in Hungary, where his father was stationed in garrison. His education was carried on in German, and he learned his native tongue from his schoolmates when a boy of ten. He studied in Deutschbrod, Klattau, and Prague, and entered the Order of Jesuits, but ten months later, on its dissolution, in 1773, returned to Prague and acquired a solid reputation through his knowledge of Hebrew and his theological scholarship. While tutor in the family of Count Nostitz (1776-87), he had the necessary leisure to devote himself to scientific pursuits, and gradually developed into an ardent student of everything connected with the Bohemian nationality, antiquities, language, and literature, and during 1780-87 issued several periodical publications dealing with those questions. Appointed subrector (1787) and then rector (1789) of the General Seminary at Hradisch, near Olmütz, he acquired many enemies by his outspokenness and fearless criticisms of men prominent in the political and social life of the country. In 1790 the seminary was closed and Dobrovský retired into private life. Two years later the Royal Bohemian Scientific Society, founded shortly before, sent him on a scientific mission. At the society's expense, Dobrovský visited Denmark, Sweden, Finland, and Russia, in 1792, and Germany, Switzerland, and Italy, in 1794, in search of ancient Bohemian manuscripts and books plundered during the Thirty Years' War. In 1801 he manifested symptoms of insanity. Though he presently recovered, the fits of mental aberration kept recurring until his death. Whenever in the throes of the malady Dobrovský was eager to destroy his works, and it was during one of these fits that he burned the Lusatian Dictionary, which was ready for the press. Although one of the most important figures in the period of the revival of Czech literature (q.v.), he did not believe in the possibility or even desirability of Bohemian renaissance, his favorite advice to the enthusiasts being: "Leave the dead alone." His interest in the literary remains of the nation was nothing beyond that of scientific investigation. This difference from the point of view of the younger enthusiastic scholars turned into a serious breach when Dobrovský attacked the authenticity of the famous *Judgment of Libusha*, discovered by Hanka in 1817. Jungmann, Hanka, Čelakovský, Palacký, and even Šafařik bitterly denounced him as a 'Slavonizing German,' but Dobrovský, though keenly grieved at the animosity of his erstwhile friends, never changed his views. His principal works are: *Scriptores Rerum Bohemicarum* (1783-84); *Geschichte der böhmischen Sprache und ältern Litteratur* (1792; 2d ed. 1818); *Die Bildsamkeit der slawischen Sprache* (1799); *Deutsch-böhmisches Wörterbuch* (1802-21); *Lehrgebäude der böhmischen Sprache* (1809; 2d ed. 1819)—the first scientific exposition of the structure of the Czech language, remarkable for its analysis of the formation of words from roots and for the simplified theory of inflection, classifying declensions and conjugations according to their stems; and *Institutiones Linguæ Slavicæ Dialecti Veteris* (1822)—an epoch-making work in that field.

DOBRUDJA, dô-bro͞o′jȧ (anciently *Scythia Minor*). A name applied to the southeastern portion of Rumania (q.v.), bounded by the Danube on the north and west, Bulgaria on the south, and the Black Sea on the east. Its area is 5999 square miles (Map: Balkan Peninsula, G 2). Its population in 1880 was 147,246; in 1899, 267,808; in 1905, 297,800, consisting of Bulgarians, Rumanians, Tatars, Circassians, Turks, Greeks, Armenians, and Jews. Before 1878 it belonged to Bulgaria. For further details, see RUMANIA.

DOBSON. See CORYDALIS.

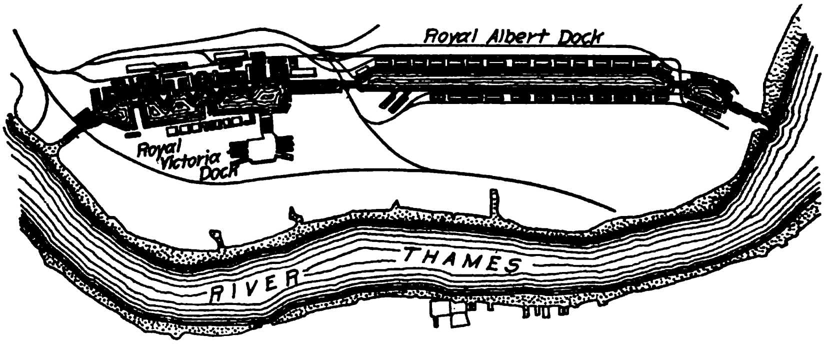
DOB′SON, HENRY AUSTIN (1840—). An English poet and critic. He was born at Plymouth, and was educated at Beaumaris, Coventry, and Strassburg. He intended to adopt the profession of his father, civil engineering, but in 1856 entered the Board of Trade as a clerk, from which he did not retire until 1902. In 1868 he published some poems in Trollope's *Saint Paul's Magazine*, and soon attracted attention by his skillful and graceful handling of French artificial forms of verse—the rondeau, ballade, and others—and by his delicate satire. In 1902 he received the degree of LL.D. from the University of Edinburgh. Among his volumes of poetry are: *Vignettes in Rhyme* (1873); *Proverbs in Porcelain* (1877); *Old World Idylls* (1883); and *At the Sign of the Lyre* (1885). Collected poems appeared in 1897. His prose includes *Lives* of Hogarth (1879; enlarged, 1900), Fielding (1883), Steele (1886), and Goldsmith (1888); *Thomas Bewick and His Pupils* (1884); *Memoir of Horace Walpole* (1890). He has edited *Eighteenth-Century Essays* (1882); Gay's *Fables* (1882); Goldsmith's *Vicar of Wakefield* (1883); Beaumarchais's *Le Barbier de Séville* (1884); *Selections from Steele* (1885); *Eighteenth Century Vignettes* (1892-94-96); a *Paladin of Philanthropy* (1899); *Samuel Richardson* (1902) and *Fanny Burney* (1903), in "English Men of Letters" Series. His critical and biographical work is excellent.

DOBSON, WILLIAM (1610-46). An English painter, born in London, and a pupil of Sir Robert Peake. He attracted the attention of Van Dyck and was presented by him to Charles I., who called him the 'English Tintoretto.' He succeeded Van Dyck at the Court, and painted the portraits of the King, Prince Rupert, and others of the Court. During the Protectorate, Dobson became very poor and died in want. There are pictures by him at many of the English country places—Blenheim, Chatsworth, Wilton, Stowe, and Windsor. His work resembles that of Van Dyck, whom he always imitated.

DOCEN, dō′tsen, BERNHARD JOSEPH (1782-1828). A German philologist, born at Osnabrück. He studied at Göttingen, where he was a pupil of Heyne, and at Jena, and from 1804 was connected with the State library at Munich, of which he was, in 1811, appointed custodian. His reputation is based largely on the critical examination of the Old and Middle High German manuscripts, which were deposited at Munich in consequence of the secularization of the cloisters in Bavaria. He was the first to call attention to the importance, in the study of the history of the German language, of the short fragments of early prose, the first Latin-German dictionaries, and the German glosses to Latin manuscripts of the period from the eighth to the twelfth century.

DOCENT′, dō-tsĕnt′ (Lat. *docere*, to teach). A teacher in German universities, with full official relations. In its more general sense, the term includes professors of all grades and the privat-docent (q.v.). In American universities it indicates a member of the teaching staff of the lowest grade. In Clark University (q.v.) it is a distinction bestowed annually upon those "whose work has already marked a distinct advance beyond the doctorate and who wish to engage in research." The appointee is expected to deliver some lectures, may receive a salary, and may be "formally invested with the *licentia docendi* . . . the highest formal academic honor." In the University of Chicago (see Chicago, University of), docent is a rank just above that of fellow. See University.

DOCE'TÆ (Lat., from Gk. *Δοκηταί, Dokētai,* from *δοκεῖν, dokein,* to seem). The name given in the early Church to heretics who held that the human nature of Jesus Christ was a semblance and not a reality. The philosophers of polytheism, as well as of Judaism, had explained the appearance of divinities and of angels by holding that the assumption of bodies was only momentary, or in appearance. And when the Gnostic Christians found it impossible to conceive the essential union of the divine nature with a body composed of matter, which they held to be the seat of all evil, they had recourse to the same expedient. The difficulty was got over in one of three ways: the body of Christ was either considered a real earthly body, but not belonging essentially to His nature, and only assumed for a time; or it was declared to be a mere appearance or illusion; or, finally, it was believed to be a heavenly body, composed of ethereal substance, though having the appearance of being material. All the Gnostic heretics held Docetism in one or other of these three forms, with the exception of those who were led by the same difficulty to deny the divine nature of Jesus Christ, and reduce him to a mere human sage. Consult the *Histories of Doctrine,* by Neander (trans. by Ryland, London, 1858), and Harnack (trans. by Buchanan, Boston, 1895-97). See Gnosticism.



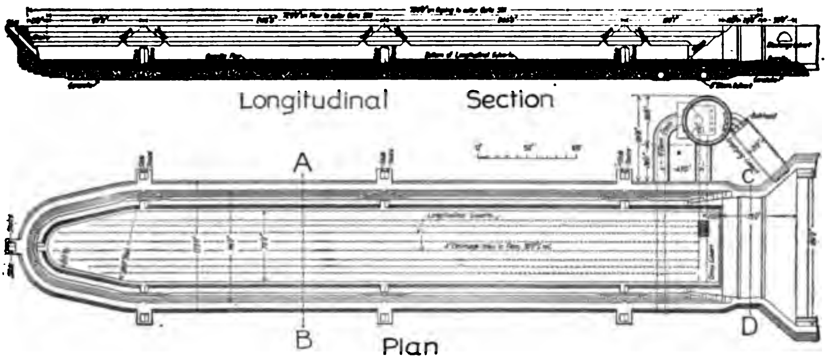
ROYAL ALBERT AND VICTORIA DOCKS, LONDON, ENGLAND.

DOCK (Ger. *Dock,* of uncertain origin). Any space or structure in or upon which a ship may be berthed or held for loading, unloading, repairing, or safe-keeping. Docks are of two kinds, wet docks, with the subclass of tidal docks; and dry docks, with the subclass of floating docks. A wet dock is a basin surrounded by quays, the entrance to which is closed by a gate and in which the water-level is constantly at the same height; a tidal dock is a similar basin open to the harbor waters, in which the water-level fluctuates with the rise and fall of the tides. A dry dock is a basin of special shape, whose entrance can be closed, and from which the water can be pumped, leaving the vessel's hull dry for the purpose of making repairs, cleaning, painting, etc.; a floating dock is a box-shaped structure open at one end which is sunk partly beneath the water to permit the entrance into it of a vessel, and is then floated so as to raise the vessel out of the water and leave the hull dry. The sinking and floating is done by filling certain compartments of the structure with water and then by exhausting this water.

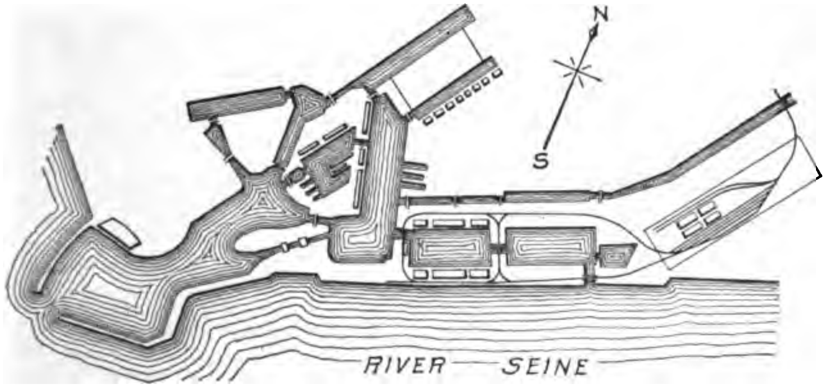
Wet Docks, separated from the harbor waters by gates, are employed when the range of the tide is considerable, as at Liverpool, where the difference in level is some 30 feet, and in the River Thames, where it is about 20 feet. The gates usually take the form of a canal lock (see Canals), and are operated by hand if small and by power if large. Most English and many Continental docks are of this type. The number of European docks and the great variations in their size and arrangement preclude a description of more than a few typical structures. At London, the Royal Albert and Victoria docks and the Tilbury Docks are two of the most important. The Royal Albert and Victoria docks are excavated across a neck of land formed by a bend in the River Thames, and thus have two entrances, one at each end. Beginning at one end there is a dock 350 feet long and 80 feet wide, which opens into a basin that is separated by a gate from the Royal Albert Dock. This dock is 6500 feet long and 490 feet wide and has an area of 84 acres. A channel 80 feet wide connects the Royal Albert Dock with the Royal Victoria Dock. This dock is 1050 feet wide and has a series of jetties or piers on one side to increase the amount of quay space: the total area is 74 acres. The Royal Victoria Dock opens into a tidal basin 16 acres in area, which in turn opens into the Thames by means of a canal and lock. The depth of water in the Albert Dock is 30 feet, and in the Victoria Dock 28 feet. The walls of these docks are built wholly of concrete.

The Tilbury Docks are differently arranged from the Victoria and Albert docks, the basins extending inland from the bank of the Thames. They comprise a tidal basin, the entrance to which is 100 yards in width. The entrance to the main basin is through a lock 80 feet in width. The walls are of concrete and the gates of the large lock are opened and closed by hydraulic power. Four large graving or dry docks form a feature of these works. These may be filled with water from the tidal basin or from the main dock through culverts. The total area of the outer tidal basin is 19¼ acres. It contains 26 feet of water at low tide and 46 feet at high tide. The main dock covers about 23 acres and has a depth of 38 feet. Three branch docks contain 9¼, 9¼, and 11 acres. These figures are sufficient to illustrate the magnitude of the work. The docks of London also comprise the London Docks and the Saint Catharine's Docks, having an aggregate area of about 50 acres; the Surrey Commercial Docks, having an area of 155 acres; the East and West India Docks, with an aggregate area of about 124 acres; and the Millwall Docks, with an area of about 35 acres.

The Liverpool dock system is one of the largest and best in the world. Its construction was begun nearly a century and a half ago, but its principal development has occurred during the last fifty years of the nineteenth century. In 1857 the Murray Docks and Harbor Board by an Act of Parliament was given the control and management of all the docks of Liverpool, including those of Birkenhead on the opposite side of the river. In 1898 this board had charge of 67 wet docks and 23 dry docks, having a frontage of about seven miles. The dock area is about 1100 acres; the largest docks are the Canada, about 18 acres; the Langton, 18⅛ acres; and the Alexandra, 17⅝ acres. The total cost of the Liverpool dock system was estimated in 1898 to have been $200,000,000. Among the other British ports which have notable docks are: Cardiff, Penarth, Barrow, Kingston, Leith, Belfast, and Tyne. On the Continent the docks at Havre, France, are particularly notable; they consist of two principal basins, having an area of about 171 acres.



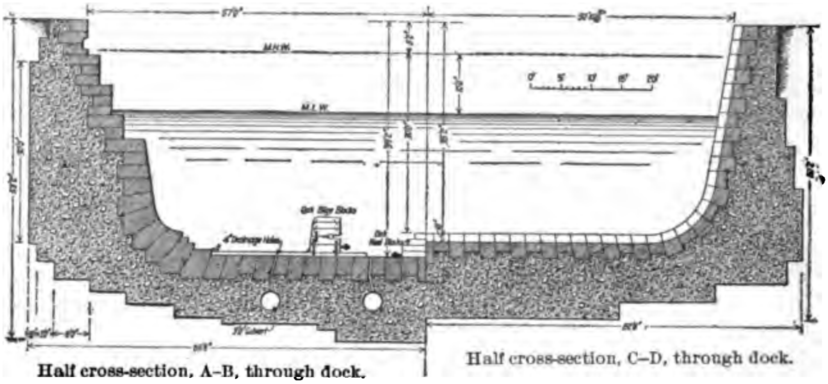
MASONRY DRY DOCK, BOSTON NAVY-YARD.



DOCKS AT HAVRE, FRANCE.

Tidal Docks are adapted to locations where the range of the tides is small, as along the Atlantic and Gulf coasts of the United States, where this range varies from 9 feet, on the New England coast, to about 2 feet at Galveston, Tex., at the Mediterranean ports, at Glasgow, Scotland, and Hamburg, Germany. The almost universal form of dock in America is a series of rectangular water-spaces between piers which project out from the bulkhead line, although tidal basin docks are found in a few places. The Atlantic Docks and the Erie Basin in Brooklyn are examples. The Atlantic Docks were commenced in 1841 and were several years in construction. More than 200 acres of land were secured by the Atlantic Dock Company, and 40 acres of low marsh land were converted into a basin. Excavation over the whole 40 acres was done mainly with dredging machines and was carried to a depth of 20 feet below low-water mark. The outer inclosure was made with piers of crib-work, consisting of timber filled with stone, which were sunk into trenches 30 feet below high-water mark. The cribs were 25 feet thick at the base and were placed 150 feet apart, that being the width of the pier. In the basin are a number of wooden piers where vessels are loaded. Upon the crib-work piers large stone warehouses are built. On the inland side is the commercial wharf, 2000 feet in length. The Erie Basin, near the Atlantic Dock, contains two graving docks. The Kingston and the Queen's Docks in Glasgow, Scotland, are good examples of tidal docks. The Kingston Dock has an area of 5¼ acres, a quay space of 2490 feet, and a depth of about 24 feet; the Queen's Dock has an area of 34 acres, a quay space of 10,000 feet, and a depth of from 27 to 30 feet.

A Dry Dock is a masonry or timber-lined basin connecting with the harbor waters and having approximately the shape of a ship's hull, into which a vessel can be floated and which can then be closed and emptied so as to leave the bottom of the vessel dry and available for cleaning and repairs. When the vessel is floated into the dock and the water removed, either by natural or artificial means, it is called a Graving Dock, while when the vessel is partially removed from the water by means of ways, and the rest of the water excluded as before, it is called a Slip Dock. In Europe it is the almost universal practice to line dry docks with masonry. In the United States the prevailing practice has been to build timber dry docks, although there has recently been a reaction against timber docks. The following figures show the leading dimensions of some important foreign and American dry docks: London-Blackwall, 471× 65 × 23 feet; Tilbury, 846 × 70×35 feet (can be divided); Liverpool, New Canada Graving Dock, 925 × 94 feet, and 565 × 70 × 22.4 feet, and 768 × 60 × 22.10 feet; Birkenhead, 750 × 85 × 26.7 feet; Belfast, 800 × 80 × 25.8 feet; Glasgow, 880 × 83 × 26.6 feet; Southampton, 660 × 91 × 32.6 feet; Plymouth, 464 × 80 × 22 feet; Hull, 550 × 65 × 21.6 feet; Leith, 410 × 70 × 21 feet; Barrow, 500 × 60 × 22 feet; Newcastle, 550 × 80 × 26.8 feet; Cardiff, 618 × 62 × 27 feet; Newport, 520 × 65 × 32 feet; Barry, two docks, 747 × 60 × 28 feet (divided), and 610 × 65 × 29 feet, in construction; Antwerp, 459 × 81 × 23 feet; Bordeaux, 540 × 72 × 27 feet; Dunkirk, 622 × 68 × 26 feet; Genoa, 622 × 68 × 26 feet; Bremerhaven, 700 × 80 × 31 feet; Sydney, 640 × 66 × 20 feet, and 608 × 84 × 32 feet; Buenos Ayres, 587 × 65 × 26 feet; Chile, 617 × 87 × 30 feet; Portsmouth, N. H., 350 × 90 × 25 feet; Boston, Mass., 367½ × 60 × 25.8 feet; New York, N. Y., 459.8 × 85 × 25½ feet, and 338¼ × 66 × 25¼ feet, and 626⅔ × 105¼ × 29 feet; League Island, Pa., 459.8 × 85 × 25½ feet; Norfolk, Va., 302¾ × 60 × 25 feet, and 495¾ × 85 × 25½ feet; Port Royal, S. C., 459 × 97 × 26 feet; Mare Island, Cal., 459 × 80½ × 27½ feet; Puget Sound, Wash., 618½ × 92.6 × 30 feet. Of the eleven American docks last named, three only are built of masonry.


Half cross-section, A–B, through dock.

Half cross-section, C–D, through dock.

CROSS-SECTION MASONRY DRY DOCK, BOSTON NAVY-YARD.

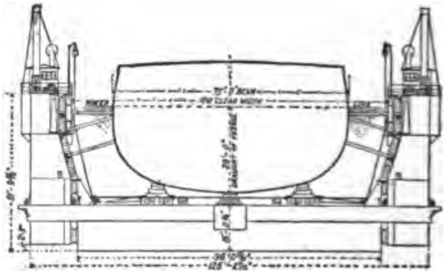
Two masonry and two timber docks have been constructed at the Navy Yards at Boston, Mass., Portsmouth, N. H., League Island, Philadelphia, Pa., and Mare Island, San Francisco, Cal. The following are the dimensions:

	Timber docks		Masonry docks	
	Ft.	*Ins.*	*Ft.*	*Ins.*
Length on coping	750	..	750	..
" " floor	725	..	725	..
Width on coping in body	120	..	144	6
" " " at abutment	101	8	101	9
Width on floor in body	80	..	80	..
" at entrance	101	..	100	..
Depth, coping to floor	39	8	39	3

Floating Dry Docks have been built in considerable numbers in both Europe and America, the majority of them being for vessels of from 2000 to 4000 tons. The latest and largest floating docks are given in the accompanying table.

Place	Date	Material	Length	Width bet. walls	Draft of Vessel	Lifting Capacity	Cost
			feet	feet	feet	tons	
New Orleans	1901	Steel	525	100	28.	15,000	$810,000
Havana	1897	Iron	450	82	27.5	10,000	1,000,000
Bermuda	1902	Steel	545	100	32.	15,500	1,350,000
Philippine Is.	1905	"	500	100	32.	16,000	1,124,000
Rotterdam	1892	Iron	361	......	...	6,000	327,000
"	1903	......	557	95	27.	14,000	486,000
Amsterdam	1899	......	429	78	20.	7,000	281,000

The New Orleans (Algiers) Dock is shown below holding a 15,000 ton battleship and consists of five pontoons or water-tight boxes. Three of these compose the bottom of the dock, while two form the side walls. These pontoons are divided by means of partitions into forty water-tight compartments, and each with an inlet for the admission of sea-water and an outlet connected by piping with steam-pumps for expelling the water. The vessel is floated in and carefully centred over the keel-blocks, and the pumps are then set to work to remove the water from the compartments. As the dock raises the vessel out of the water, shores are inserted between the vessel's hull and the side walls, and the pumping is continued until the floor of the dock is raised above the water-level. The Philippine Island Dry Dock *Dewey*, the largest in the world, was constructed at Sparrows Point, Md., in 1905 and towed to the Philippines. It is in three sections so as to be self-docking. If the central section, which is 316 feet long, is to be docked, the two end sections are detached, placed beneath it and exhausted of water, while if the end sections are to be docked they are placed in the mid-section as a vessel would be and it is pumped free of water. The dock is operated by steam. Consult Colson, *Notes on Dock Construction* (London, 1894); Stevenson, *Design and Construction of Harbors* (London, 1886), and Cunningham, *Principles and Practice of Dock Engineering* (London, 1904). A recent book in French is Cardmoy, *Les ports*


SECTION OF THE ALGIERS FLOATING DRY DOCK.

modernes (Paris, 1900). Consult the proceedings of the various engineering societies and the engineering journals.

DOCK (AS. *docce,* probably connected with Gael. *dogha,* burdock). A name applied to those species of the section Lapathum, of the genus Rumex, which are not acid or only slightly so, and of which the flowers are perfect or polygamous. The other species are generally called sorrel (q.v.). The docks are mostly large, perennial, herbaceous plants, natives chiefly of temperate climates, with large, generally lanceolate or ovate leaves, and panicles of small, greenish flowers. They multiply rapidly by seed, have great tap-roots, and are with difficulty eradicated from pastures. The best mode of dealing with them is generally found to be repeated cutting away of the leaves and shoots, by which the plants are killed. Many of the species prefer watery places. A number are natives of the British Isles, and several of the European species have been introduced into North America, where also a number of indigenous species are found, and have been troublesome weeds. Useless and even troublesome as the docks are generally esteemed, the large, astringent roots are yet capable of being beneficially employed in medicine; and those of the greater water-dock (*Rumex Britannica*), in particular, for which the Druids entertained a superstitious veneration, are administered as an antiscorbutic, astringent, and tonic. Those of *Rumex crispus,* the yellow dock, are used in the same manner. The roots contain variable quantities of tannin, and the occurrence of this in large quantities in canaigre (*Rumex hymenosepalus*) (q.v.) has been made use of in tanning fine grades of leather. The young leaves of a number of species are often used as pot-herbs.

DOCKET (also, obsolete or rare forms, *docquet, doquet, dogget;* probably a diminutive noun from *dock,* to shorten, from *dock,* Icel. *dokr,* stumpy tail). In law, an official record of judicial proceedings. Originally the term was used to denote a brief summary of the contents of a document upon which it was indorsed, so that its tenor might be known without complete perusal. It is probable that these memoranda in time came to be transcribed in a book to which the name of docket was then applied. This was particularly the case with records of judgments, and in the United States a register of money judgments is called a docket. Under statutes giving judgments the force of liens on the real estate of the judgment debtor, it is not the rendering or the 'entry' of the judgment, but its docketing, which gives it that effect.

But the main use of the word docket in the United States is as the name of a list of causes before the court for trial, entered in the order in which the case is to be called, in a book kept by the clerk of the court. Such a docket is called by the practice of some courts the calendar. The docket, or calendar, is called over at the opening of the court each day—or sometimes once a week—and at the request of counsel the case may, in the discretion of the judge, be removed to a less advanced stage on the docket, or put on that for the next term of court. A special use of the word in England is for a copy of a chancery decree left with the proper clerk of the court for enrollment.

DOCK WARRANT. A written instrument given by a dock-owner to the owner of goods therein described, acknowledging their receipt and engaging to deliver them to the owner or to his assignee. It is a species of warehouse receipt. It differs from a bill of lading at common law in a very important respect—it is not a symbol of the goods for which it is given, and its assignment and delivery, even to a purchaser of the goods for value, does not have the legal effect of a delivery of the goods themselves, while the indorsement and delivery of a bill of lading does. The reasons assigned for this difference are two: (1) A bill of lading is an ancient mercantile document governed by the rules of the law merchant, while a dock warrant is modern and controlled by common-law principles. (2) A bill of lading is the representative of goods which are at sea or in the possession of a common carrier on land. One who transfers this document does all that it is possible for him to do to give possession of the goods to the purchaser. On the other hand, it is always possible for parties to a sale and purchase of goods in a dock-owner's possession to make an actual transfer of that possession.

The foregoing doctrine of the common law has been changed by the Factors Act in England, which puts dock warrants on the same footing with bills of lading. As a species of warehouse receipts they are declared by statute to be negotiable in many of our States.

Consult: Blackburn, *Contract of Sale* (2d ed., London, 1885); Benjamin, *Treatise on the Law of Sale of Personal Property* (7th ed., Bennett, editor, Boston, 1899); Stevens, *The Elements of Mercantile Law* (4th ed., London, 1903).

DOCKYARDS, Royal. The beginnings of the present royal dockyards of Great Britain may be found in the establishment of the Portsmouth dock by order of Henry VII. in 1495. Before that time docks were mere temporary arrangements by which a ship was laid ashore at a suitable place. In line with his war and naval policy, Henry VIII. founded several others—Deptford, in 1513, which, by the end of the reign, became the most important of all; Woolwich, perhaps as early as 1512; and Erith, of which we hear in January, 1514. Before this time, the kings had possessed a variable number of ships, relying in emergencies on the Cinque Ports, which had to supply vessels in return for their privileges; now it was proposed to keep the navy on a permanent footing. During the sixteenth century the dockyard at Deptford continued to be the most important, but under Charles I. and the Commonwealth Portsmouth surpassed it. Under James I. there was great corruption in the management of the dockyards, which was not remedied until 1618, when a commission showed that the total expenditures, £53,000, might well be reduced to £30,000 (S. R. Gardiner, *History of England, 1603-42,* London, 1883, ii., 203-06). They flourished under the Commonwealth, but declined under the Stuarts. The Duke of York (afterwards James II.) was an excellent naval minister. In his management of the dockyards he was greatly aided by the efficient Samuel Pepys, Secretary of the Admiralty. In 1805-08, as a result of a commission appointed by the House of Commons, the yards were again sweepingly reformed. A uniform system of management was established, which was afterwards somewhat modified. The dockyards are controlled by the Admiralty, the Comptroller of the Navy having general supervision. Each yard is under a superintendent who is an officer of the navy.

The dockyards contain all the necessary appliances for the building and equipment of ships. Until recently they constructed nearly all vessels of the British Navy, but the use of steam and steel armor-plate has greatly increased the number of ship-building contracts with private firms. In the naval estimates of 1900, expenditures of £6,956,000 were made for the royal dockyards, of which sum £2,512,000 were for wages. The same year £6,329,000 were expended with private firms.

Among the royal dockyards, that of Pembroke is best adapted for building purposes; Portsmouth is most important of all, and Chatham is but little inferior. Others exist at Sheerness, Devonport, and Keyham, while Plymouth, Gosport, and Deptford are now used for victualing purposes only. There are also the following docks in Ireland and the colonies: Haulbowline (Cove of Cork), Malta, Esquimalt (Vancouver Island, B. C.), Colombo (Ceylon), Bermuda, Gibraltar, Halifax, Bombay, Simon's Bay (near Cape Town), Kingston (Jamaica), Hong Kong, Trincomali, and Delagoa Bay. For early history, consult M. Oppenheim, *The Administration of the Royal Navy, 1509-1660* (London, 1896), an excellent work; also W. L. Clowes, *The Royal Navy, a History* (Boston and London, 1897-1900). There is a good report on the national dockyards in Europe in *House Miscellaneous Documents*, 1st ser., 49th Congress (1885-86), xiii., No. 237.

DOCTOR (Lat., from *docere*, to teach). A title formerly used, in accordance with its derivation, to signify a teacher in general; in more recent times it is a title of honor conferred by universities. The word had long been used as a general term for teacher, before it came to designate degree or rank in the learned hierarchy, to which only the united body could advance the candidate. In this sense it seems to have been first used at Bologna about the middle of the twelfth century—not earlier, as it is never found applied to the learned Irnerius, the regenerator of the Roman law at that period, who called himself *judex*, and was called by others *magister*, *dominus*, or *causidicus*. The first to bear it were the so-called 'four doctors'—Bulgarus, Martinus, Jacobus, and Hugo. When it began to be formally bestowed, it conferred the unrestricted right to teach, and a voice in the granting of degrees to others. Originally confined to teachers of civil law, by the end of the century it was also applied to canonists; a decretal of Innocent III. proves the existence of *doctores decretorum* as well as of *doctores legum*. This distinction between the two branches of the law has left a trace even to the present day in the degree granted by some German universities of J.U.D., *juris utriusque doctor*, 'doctor of both laws,' and in the more familiar LL.D., where the double L stands for the plural *legum*. In the thirteenth century doctors of medicine, grammar, logic, and philosophy are found; the jurists, however, seem to have attempted to limit the use of the title to themselves, leaving that of *magister* to the theologians and others. The University of Paris almost immediately followed in the footsteps of Bologna, the first bestowment of doctors having taken place in the year 1145, in favor of Peter Lombard and Gilbert de la Porrée, the greatest theologians of the day. The emperors were accustomed to grant the universities the right of appointing doctors of law by their authority and in their name;. in the same way the popes conferred the right in regard to canon law. Throughout the Middle Ages, however, there was a tendency to confuse the titles of master, doctor, and professor. In the University of Paris, and others which closely imitated it, the term 'master' was commonly used in the faculties of medicine, theology, and arts; but the title of professor is frequently, and that of doctor occasionally, employed. At first the same confusion existed at Oxford, but during the fifteenth century the custom gradually prevailed in the English universities of limiting the use of the title doctor to the faculties of law, theology, and medicine. In Germany the title was known as early as the thirteenth century, and for a long time very highly regarded; doctors were recognized, even by the Imperial law, as entitled to the privileges of nobility. But when the degree began to be carelessly conferred they sank in the public estimation, until it was possible for a proclamation in Hesse-Cassel, 1762, to put them in the tenth class, with valets and the like. In France, also, while up to the Revolution the highest consideration attached to the title of Doctor of the Sorbonne (q.v.), that famous theological faculty which was called "the perpetual council of the Gallican Church," such was by no means the case with the degrees of the other schools of learning. Furetière, in his dictionary, defines a scholar as a man who learns, and a doctor as a man who forgets. In England the doctor's degree was not introduced into the universities till the reign of John or Henry III. For a time it was a very rare and highly prized honor, and the ceremony of conferring it was attended with scenes of feasting and revelry, of which curious accounts will be found in Antony à Wood, *History and Antiquities of the University of Oxford* (London, 1792-96). In modern times the title of doctor has been applied almost everywhere to the three faculties of theology, law, and medicine. In America and Germany it extends to that of philosophy, and in the latter country the degree of "doctor of philosophy and master of arts" is conferred, as if the two were equivalent. Oxford and Cambridge, and in modern times some of the German and American universities, also create doctors of music. The doctor's degree is, in general, conferred at the instance of the dean of the faculty to which it appertains. It is granted on examination, or after at least the ancient form of publicly defending a learned thesis in Latin has been observed; or else it is an honorary degree, conferred in consideration of the general reputation of the recipient for eminence in some particular branch of learning, or occasionally on account of some other distinction. The musical degree in the English universities is given only after approval of a cantata composed by the candidate and performed at his expense. Consult: Rashdall, *Universities of Europe in the Middle Ages* (Oxford, 1895); Denifle, *Die Universitäten des Mittelalters bis 1400* (Berlin, 1885); and the authorities referred to under UNIVERSITY. For professional uses of the degree of D.C.L., see DOCTORS' COMMONS.

DOCTOR, THE. A romance by Robert Southey, first issued anonymously (1834). It is a long exposition of learning, saved from being insufferably tedious and pedantic only by the genial nature of its principal character, Dr. Dove, to whom the gratitude of unnumbered young people is due for the story of *The Three Bears*.

DOCTOR AND STUDENT. The title of a celebrated little book on the common law, which made its appearance in the reign of Henry VIII., probably about 1530. It is attributed to one Christopher Saint Germain, a barrister of the Inner Temple, about whom nothing definite is known. The work was originally composed in Latin, and is cast in the form of a dialogue between a doctor of divinity and a very learned 'student' of the common law, the latter instructing the former in a somewhat didactic manner in the mysteries of his system. It contains some suggestive discussion of legal principles, common-law doctrine being sometimes effectively contrasted with the corresponding doctrine of the civil law, usually to the disadvantage of the latter. The book contrasts the doctrine of consideration in contracts, which was then beginning to take form in the English legal system, with the Roman law doctrine of *causa*, and throws a good deal of light upon the former. The work is a mere fragment, however, and though it has enjoyed a considerable reputation it never rose to the rank of a legal authority. It appears to have taken on its present English form in the lifetime of the author, being, perhaps, translated by his own hand. It has passed through many editions, the best being the eighteenth, by Muchall, published in Dublin in 1792, and republished in Cincinnati in 1874.

DOCTOR-FISH. See SURGEON-FISH.

DOCTOR JEKYLL. See STRANGE CASE OF DR. JEKYLL AND MR. HYDE.

DOCTORS' COMMONS. A name applied both to the association of doctors of the civil and canon law in London, practicing by exclusive privilege in the ecclesiastical courts, and to a building erected by them about 1567 near Saint Paul's for the accommodation of those courts and the Court of Admiralty. The doctors were divided into two classes—advocates and proctors—corresponding to attorneys and solicitors, and were headed by a president, the dean of arches for the time being. Admission to practice was granted to a D.C.L. of Cambridge or of Oxford by the decree of the Archbishop, after an elaborate ceremony. The college was dissolved in 1857 and the property sold, the proctors being given privileges of solicitors and receiving compensation, and solicitors being allowed to act as proctors. The principal ecclesiastical court comprised in the Doctors' Commons was the Court of Arches, the appellate court of the Archbishop of Canterbury, presided over by the dean of arches, with original jurisdiction in all ecclesiastical cases in the Province of Canterbury, and also in cases raised by letters of request. (See LETTERS.) Divorces were formerly tried here, but are now tried by the Divorce Court. The other courts have in the main suffered the same fate. They comprised the Archdeacon's Court, for ecclesiastical cases in the archdeaconry; the Prerogative Court, with certain probate jurisdiction (now transferred to the Probate Court); the Faculty Court, for the granting of dispensations; and the Court of Delegates, in cases of ecclesiastical appeals (now transferred to the judicial committee of the Privy Council). The buildings as well as the organization of the Doctors' Commons have disappeared, the courts have been amalgamated with others, the officials have lost their special privileges, but the old names remain, and will probably die out but slowly. For the statutes concerning the changes in the old arrangement, consult: 20 and 21 Vict., c. 77; 21 and 22 Vict., cc. 95, 108; 23 and 24 Vict., c. 27; 33 and 34 Vict., c. 28, s. 30; 40 and 41 Vict., c. 25, s. 17. Consult also Stow, *Survey of London* (London, 1598). See ARCHES, COURT OF; ATTORNEY; BARRISTER; SOLICITOR.

DOCTORS OF THE CHURCH. A title long current for the most eminent of the early Christian teachers, and applied especially to the four Greek fathers—Athanasius, Basil, Gregory Nazianzen, and Chrysostom—and the four Latin fathers—Jerome, Augustine, Ambrose, and Gregory the Great. In more recent times the title has been formally conferred by the Pope on saints eminent for theological learning, some as modern as Saint Alphonsus Liguori (died 1787). In the Middle Ages the name of doctor was freely applied to the leading theologians, with some additional expression characterizing the peculiar gift of the writer designated.

The following alphabetical list of such affixes is taken from Wetzer and Welte, *Kirchenlexikon*, 2d ed. by Kaulen (Freiburg, 1882-1900). The date is that of death, and the contractions are as follows:

O.Carm. = Carmelite.
O.Carth. = Carthusian.
O.Cist. = Cistercian.
O.M. = Minorite or Franciscan.
O.P. = Dominican.
O.Præm. = Præmonstratensian.
O.S.A. = Augustinian.
O.S.B. = Benedictine.
O.Trin. = Trinitarian.
S.J. = Jesuit.

Doctor abstractionum, acutus et illuminatissimus—Francis of Mayroni, 1325.

—acutissimus—Francis della Rovere (Pope Sixtus IV.), 1484.

—acutus—Gabriel Vasquez, S.J., 1604.

—admirabilis (mirabilis)—Roger Bacon, O.M., 1294.

—amœnus—Robert of Cownton, O.M., about 1340.

—angelicus, communis, or cherubicus—Saint Thomas Aquinas, O.P., 1274.

—authenticus—Gregory of Rimini, O.S.Aug., 1358.

—authoratus, copiosus, fundatissimus et solidus—Richard of Middleton, O.M., about 1300.

—beatus et fundatissimus—Giles Colonna, O.S.A., 1316.

—bonus—Walter Brinkelius, O.M., about 1310.

—Christianissimus—John Charlier of Gerson, 1429.

—Christianus—Nicholas of Cusa, 1464.

—clarus—Louis de Montesinos, 1621.

—clarus et subtilis—Dionysius junior, O.Cist., fourteenth century.

—collectivus—Landolfo Caracciolo, O.M., 1351.

—columna doctorum—William of Champeaux, O.S.B., 1121.

—contradictionum—John Wessel, 1489.

—conspicuus et planus—Walter Burley, after 1337.

—divinus, ecstaticus—John of Ruysbroeck, 1381.

—doctorum—Anselm of Laon, 1117.

—dulcifluus—Antony Andrea, O.M., about 1320.

—ecstaticus—Dionysius of Rickel, O.Carth., 1471.

—elegans et facundus—Peter Aureoli, O.M., 1322.
—eminens—Saint John of Matha, O.Trin., 1213.
—evangelicus—John Wyclif, 1384.
—excellentissimus—Antony Corsetti, 1503.
—eximius—John Tisserius, O.M., about 1564, and Francis Suarez, S.J., 1617.
—famosissimus—Peter Alberti, O.S.B., about 1426.
—famosus—Bertrand de la Tour, O.M., 1334.
—fundamentalis, subtilis et perspicacissimus—John Faber of Bordeaux, about 1350.
—fundatus—William Verus (de Waria), O.M., about 1270.
—illibatus—Alexander Alamannicus, O.M., fifteenth century.
—illuminatus—Raymund Lulli, O.M., 1315.
—illuminatus et sublimis—John Tauler, O.P., 1361.
—illustratus—Francis Picenus, O.M., fourteenth century.
—illustris or illustratus—Adam of Marisco, O.M., about 1380.
—inclytus—William Mackelfield, O.P., about 1300.
—ingeniossimus—Andrew of Neufchâteau, O.M., about 1300.
—invincibilis—Peter Thomas, O.M., fourteenth century (?).
—invincibilis et singularis—William of Occam, O.M., 1349.
—irrefragabilis, fons vitæ, monarcha theologorum—Alexander of Hales, O.M., 1245.
—magnus, universalis—Alan of Ryssel, O.Cist., 1202.
—marianus—Saint Anselm of Canterbury, 1109, and John Duns Scotus, O.M., 1308.
—mellifluus—Saint Bernard, O.Cist., 1153.
—mellifluus alter—Ælred, O.Cist., 1166.
—mirabilis—Antony Perez, S.J., 1649.
—moralis—Gerhard Eudo, O.M., 1349.
—notabilis—Peter of Ryssel, O.M.
—ordinatissimus or ornatissimus—John of Bassoli, O.M., about 1347.
—ornatissimus et sufficiens—Peter of Aquila, O.M., about 1344.
—pacificus et proficuus (profitabilis)—Nicholas Bonet, O.M., 1360.
—planus et utilis—Nicholas of Lyra, O.M., 1341
—præclarus—Peter of Kaiserslautern, O.Præm., about 1330.
—præstantissimus—Thomas Netter of Walden, O.Carm., 1431.
—profundus—Thomas of Bradwardine, 1349.
—profundissimus—Paul of Venice, O.S.A., 1428; Gabriel Biel, 1495; John Alphonsus Curiel, O.S.B., 1609.
—refulgidus—Peter Philargi (Pope Alexander V.), 1410.
—resolutissimus — William Durand of Saint Pourçain, O.P., 1332.
—resolutus, princeps Averroistarum—John Bacon, O.Carm., 1346.
—scholasticus—Peter Abélard, 1142; Gilbert de la Porrée, 1154; Peter Lombard, 1164; Peter of Poitiers, 1205; and Hugh of Castro Novo, O.M., after 1322.
—seraphicus—Saint Bonaventura, O.M., 1274; sometimes also Saint Francis of Assisi, O.M., 1226.
—solemnis—Henry Goethals of Ghent, 1293.
—speculativus—James of Viterbo, O.S.A., 1308.
—sublimis—Francis of Bachone, O.Carm., 1372, and John Courtecuisse, about 1425.
—subtilis—John Duns Scotus, O.M., 1308.
—subtilissimus—Peter of Mantua, fourteenth century (?).
—succinctus—Francis of Ascoli, O.M., about 1340.
—summus doctorum—Peter of Belle-Perche, 1308.
—universalis—Albert the Great, O.M., 1280.
—venerandus—Walfried de Fontibus, O.M., after 1240.

DOCTOR'S TALE, The. A story contained in Chaucer's *Canterbury Tales*, supposed to be narrated by a doctor of physic, and consisting of an English version of the Roman legend concerning Appius and Virginia, as recounted in the *Roman de la Rose*.

DOCTOR SYNTAX. See Combe, William.

DOCTRINAIRE, dŏk'trĕ'nâr' (Fr., theorist, from Lat. *doctrina*, doctrine). A term used to designate one who is an advocate of principles rather than of practical schemes in government and politics. After the first restoration of the Bourbons, in 1815, the term came to be applied in France to a portion of the Parliamentary Opposition which urged the adoption of a plan of government somewhat similar to the English system of a limited monarchy with Parliamentary control. For these views they were ridiculed by Republicans and Monarchists and called *doctrinaires*. Mounier, Lally-Tollendal, Clermont-Tonnerre, Talleyrand, and the Abbé Montesquiou were the true fathers of the party. They had their rallying-point in the salons of the Duke de Broglie, and were led in the Chamber by Royer-Collard and supported in the press by Guizot, Villemain, Barante, and the younger members of what afterwards became the Orleans party. The development of the Constitution on the basis of the charte of Louis XVIII. was their watchword, but their real inspiration was derived from England. When the Revolution of 1830 occurred, they became the advisers and ministers of Louis Philippe, and were more deeply imbued with the principles of constitutional monarchy than any other political party that has ever existed in France. The Revolution of 1848 did away with the doctrinaires as a political party exerting an influence on the Government, and the term ceased to be used save historically or in an abstract sense. Consult: Thureau-Dangin, *Le parti libéral sous la Restauration* (Paris, 1876), and the Memoirs of Guizot (2 vols., Paris, 1858-68), Barante (Paris, 1890), and Duke de Broglie (Paris, 1886). There is an English translation of Guizot's *Mémoires*, under the title of *Memoirs to Illustrate the History of My Own Time* (4 vols., London, 1858).

DOCTRINE. See Dogma.

DOCTRINE, Fathers of Christian. A clerical brotherhood in the Roman Catholic Church. It was founded by César de Bus (1544-1607), who, after a dissipated military career, turning to piety, was ordained in 1582 and became zealous in all good works. Devoting himself especially to opposing the progress of the Huguenots in France, in 1592, he joined with Romillon, a canon of Isle, who was a convert from Calvinism, Pinelli, a canon of Avignon, and two others to form a congregation of secular priests for the purpose of teaching Christian doctrine to the ignorant. It was confirmed by

Clement VIII. in 1597, and the founder, resigning his canonry, became its first superior. He left a reputation for great sanctity, and was declared venerable by Pius VII. in 1821. His successor, Father Vignier, after founding several daughter houses, sought to make the brotherhood a regular congregation with solemn vows. Pope Paul V. granted this on condition that they should unite with some existing regular congregation. In 1616, accordingly, they made a connection with the Italian congregation of Somasco, founded by Saint Jerome Æmiliani; but a few members, not feeling bound to make the solemn vows, joined the French Oratorians. The connection was dissolved by Innocent X. in 1647, and Alexander VII. allowed the *Doctrinaires* (as they are called in France) to make the simple vows, with the addition of that of perseverance. Under the new system they spread into Italy. After great difficulties from the French Revolution, and internal dissensions which ended in Pius VII. deciding in 1805 against any vows for the future, they made themselves useful in the nineteenth century, especially in schools and diocesan seminaries, and at the present time have about 600 members.

DÓCZI, Ludwig von, dŏ'tsē (1845—). An Hungarian publicist and author, born at Odenburg. He was educated in Vienna and Budapest, was for a time a journalist, in 1867 became an official in the Austro-Hungarian Ministry of the Interior, and later a councilor in that of Foreign Affairs. His publications include the dramas *Utolsó próféta* (1868) and *Csók* (1871), several works in prose, fiction, and poems. He also made some translations into Hungarian, in particular of the first part of Goethe's *Faust* (new ed. 1878) and of Schiller's poems (1903).

DOD, Daniel (1788-1823). An American mechanician, born in Virginia. He was educated at Rutgers College, and became one of the most successful engine-builders in the United States. He constructed the engine for the *Savannah*, the first steamer that ever crossed the Atlantic. He was killed by a boiler explosion at New York City.

DODD, Moses Woodruff (1813-99). An American publisher, born at Bloomfield, N. J. After graduation at Princeton in 1837, he entered the Princeton Theological Seminary, but was soon obliged by ill health to relinquish his studies for the ministry, and in 1839 formed a partnership with John S. Taylor, then a leading publisher of New York. Mr. Taylor having withdrawn in 1840, he continued the business under the style of M. W. Dodd until his retirement in 1870. The publications of the house during this period were chiefly theological or religious. Frank Howard (1844—), son of the preceding, was born at Bloomfield, N. J. In 1870, with Edward S. Mead, he succeeded to the business of his father, under the firm name of Dodd & Mead, the establishment becoming, with the admission of Bleecker Van Wagenen in 1876, Dodd, Mead & Company. Afterwards he became the active head of the firm and was instrumental in establishing the *Bookman*, the *New International Encyclopædia*, and other important enterprises. As booksellers, the firm has become one of the leading authorities upon and dealers in rare books. It has published the works of many of the best-known modern writers in fiction and general literature and art.

DODD, William (1729-77). An English clergyman and man of letters. He was born at Bourne, in Lincolnshire; graduated at Clare Hall, Cambridge, and was ordained in London, where he became a popular preacher. In 1763 he was appointed tutor to Philip Stanhope, the fifth Earl of Chesterfield. His extravagances led him in after-life to forge the signature of his former pupil, the Earl of Chesterfield, for which he was tried, convicted, and executed, in spite of the efforts of his friend, Dr. Johnson. Among his numerous writings are: *Beauties of Shakespeare* (1752), which supplied Goethe with his first knowledge of the poet; *Reflections on Death* (1763); and *Thoughts in Prison* (1777). Consult: Fitzgerald, *A Famous Forgery, Being the Story of the Unfortunate Dr. Dodd* (London, 1865).

DOD'DER (AS. *dodder*, probably connected, as being a yellow plant, with AS. *dydrin*, OSax. *dodro*, OHG. *totoro*, yolk of an egg), *Cuscuta*. A genus of plants referred by some botanists to the natural order Convolvulaceæ, and regarded by others as the type of a small distinct order Cuscutaceæ. The plants are leafless, climbing parasites, with flowers in dense clusters; have scales on the tube of the corolla alternate with its segments, and a spiral thread-like embryo, lying in a mass of fleshy albumen. The cotyledons are so small that the embryo has been described as destitute of them. There are about fifty known species of Cuscuta, chiefly found in the warmer temperate parts of the globe, about twenty occurring in the United States. The name dodder is often extended to all of them. One or two species of Cuscuta are natives of Great Britain, parasitic on leguminous plants, heath, thyme, hops, nettles, etc. A species of dodder, *Cuscuta epilinum*, is very injurious to crops of flax in Germany, and leguminous crops often suffer from *Cuscuta epithymum* and *Cuscuta trifolii* in the south of Europe. Some of these species have been introduced in clover and alfalfa seed from Europe and are fast becoming serious pests of clover and alfalfa fields. Only clean seed should be sown, and where dodder has become established the crop should be cut and burned before the dodder-seeds mature. It usually appears first in isolated patches, the spreading of which may be prevented by careful attention. The seeds are slightly smaller than clover-seed and may be screened out if care be given the operation. The seed of dodder germinates in the ground, but the stem soon seeks to attach itself to plants by little rootlets (haustoria) which it sends out, and the original root dies. The appearance of dodder has been described as resembling "fine, closely tangled, wet catgut." For illustration, see Plate of Parasitic Plants.

DODD'RIDGE, Philip (1702-51). An English Nonconformist clergyman and writer. He was born in London, and was educated for the ministry at Kibworth, in Leicestershire, where he became pastor of a dissenting congregation. In 1729 he received a call to Northampton, and became president of the theological academy there. He formed a society for the distribution of Bibles among the poor and submitted to his denomination what has been called the first project for foreign missions among the Nonconformists. His principal writings are: *The Rise and Progress of Religion in the Soul* (1750), which has been translated into many languages; *The Family Expositor* (1739-56); and his *Course of Lectures*, delivered to the students under his charge, and published by the Rev. Samuel Clarke (1763). Many of his hymns are still used by different denominations. Consult *The Correspondence and Diary of Philip Doddridge*, edited by his great-grandson, John Doddridge Humphreys (London, 1829-31).

DODEC'ATHE'ON. See Cowslip.

DODE DE LA BRUNERIE, dōd de lȧ brụn'-rē' (1775-1851). A French soldier, born at Saint-Geoire (Isère). He served in the engineer corps in the Rhenish, Egyptian, and Italian campaigns, distinguished himself at Rastadt, and in 1805 he became a colonel. He directed the siege operations at Saragossa in 1809, was promoted to be general of division in 1812, and maintained a magnificent defense of the fortress at Glogau in 1813. In 1823 he was commander of engineers in the Spanish campaign, in 1840 was appointed president of the committee on fortifications, and in 1840-45 completed the defenses of Paris. He received the marshal's baton in 1847—the first engineer since Vauban, it is said, to be thus honored.

DÖDERLEIN, dē'dēr-līn, Ludwig (1791-1863). An eminent German classical philologist and teacher of the classics, born at Jena. He studied under Tiersch in Munich (1810-11), then two years in Heidelberg, and later in Erlangen and Berlin. In 1815 he became professor of philology in Bern, and in 1819 was called to Erlangen as rector of the gymnasium and professor of philology in the university. Here he remained until his death. Döderlein combined with accurate scholarship a rare enthusiasm and skill in teaching which had a most important influence on the schools and teachers of Bavaria. His most important published works are: editions of Sophocles's *Œdipus Coloneus* (1825); *Tacitus* (1841-47); *Horace's Epistles* (1856-58); *Satires* (1860); *Iliad* (1863-64). He also wrote the following treatises: *Lateinische Synonymen und Etymologien* (1826-38); *Lateinische Wortbildung* (1838); *Handbuch der lateinischen Synonymik* (1839); *Handbuch der lateinischen Etymologie* (1841); *Homerisches Glossarium* (1850-58); *Reden und Aufsätze* (1860). Consult: Bursian, *Geschichte der klassischen Philologie in Deutschland* (Munich, 1883); *Allgemeine deutsche Biographie*, v. (Leipzig, 1877).

DODGE CITY. A town and the county-seat of Ford County, Kan., 302 miles west by south of Topeka, on the Arkansas River, and on the Atchison, Topeka and Santa Fé and the Chicago, Rock Island and Pacific railroads (Map: Kansas, C 4). Soule College (Methodist Episcopal), opened in 1894, is located there. Dodge City is a division point on the Santa Fé railroad and is the centre of a stock-raising and wheat-growing district. In the seventies it was famous in the West as a lawless Texas cattle-shipping point. Population, 1900, 1942; 1905, 2603.

DODGE, Charles Richards (1847—). An American expert on fibres and fibre industries. He was born in Mississippi, and was educated at Sheffield Scientific School, Yale. He became associated with the United States Department of Agriculture in 1867, and was subsequently appointed director of the Agricultural Museum. In 1890 he began the fibre investigations of the Department of Agriculture. His *Dictionary of the Fibres and Fibre Plants of the World* (1897) is a work of considerable value.

DODGE, Daniel Kilham (1863—). An American educator and author. He was born in Brooklyn, N. Y., graduated at Columbia University in 1884, and was a fellow there from 1884 to 1889. In 1889-92 he was a tutor at Columbia, and in 1892 was appointed professor of English language and literature in the University of Illinois. His publications include *Abraham Lincoln: The Evolution of His Literary Style* (1890).

DODGE, Grenville Mellen (1831—). An American soldier and civil engineer. He was born at Danvers, Mass., and was educated at a military academy and at Norwich University, Vermont. He was a member of the Government survey along the Platte for a railway to the Pacific, one of the first surveys to be instituted for that purpose. He fought throughout the Civil War, and rose to the rank of major-general of United States volunteers. In 1864 he commanded the Sixteenth Corps of General Sherman's army in the campaign before Atlanta (May to September), and subsequently succeeded Rosecrans as commander of the Department of Missouri. He afterwards became chief engineer of the Union Pacific and Texas Pacific railways. From 1867 to 1869 he served as a member of Congress from Iowa, and in 1898 was made president of the commission appointed to investigate the charges of mismanagement relative to the Spanish-American War.

DODGE, Mary Abigail (c.1830-96). An American writer, known as 'Gail Hamilton,' born at Hamilton, Mass. She was at first a schoolteacher, was an editor of *Our Young Folks*, Boston (1865-1867), and after 1876 lived in Washington. Her writing is straightforward, pungent, aggressive, brilliant, and was from the first popular, though in the main ephemeral. She wrote: *Gala Days* (1863); *Red Letter Days in Applethorpe* (1866); *Woman's Wrongs* (1868); *The Battle of the Books* (1870); *Woman's Worth and Worthlessness* (1871); *Sermons to the Clergy* (1875); *Our Common School System* (1880); *The Irrepressible Book* (1885); *Chips, Fragments and Vestiges* (1902). During the winter of 1890-91 Miss Dodge conducted a Bible class for adults in Washington and published her talks as *A Washington Bible Class* (1891). She wrote almost entirely under the pen-name Gail Hamilton, the former word being the last syllable of Abigail, the latter her birthplace.

DODGE, Mary Elizabeth Mapes (1838-1905). An American editor, poet, and juvenile writer, a daughter of Prof. James J. Mapes. She was born and educated in New York, and became the wife of William Dodge, a lawyer of that city, but was soon left a widow. She began literary work on the staff of *Hearth and Home*, and in 1873 became editor of *Saint Nicholas*, the juvenile magazine, which under her direction came to occupy a field practically undisputed in the United States. A frequent contributor to other periodicals, she also wrote several volumes of juvenile verse and prose, of which the more noteworthy are *Hans Brinker; or, the Silver Skates* (1865; a new illustrated ed., 1901; translated into five European languages and crowned by the French Academy); *Theophilus and Others* (1876); *Donald and Dorothy* (1883); and *The Land of Pluck* (1894). She also published two collections of poems, *Along the Way* (1886); *When Life is Young* (1894); and *Poems and Verses* (1904).

DODGE, Theodore Ayrault (1842—). An American soldier and military historian. He was born in Pittsfield, Mass., and was educated abroad, studying military science in Berlin under General Von Frohreich of the Prussian Army and graduating at the University of London in 1861. He then returned to the United States, enlisted as a private in the Federal Army, lost a leg at Gettysburg, and rose to the rank of major in the Veteran Reserve Corps in 1864. He was brevetted colonel of volunteers in December, 1865, was appointed captain in the regular service in July, 1866, was brevetted lieutenant-colonel in the regular army in 1867, and served as chief of the Bureau of Enrollment in the War Department until 1870, when he was retired. He is best known as a military historian and critic, and his *Bird's Eye View of Our Civil War* (1882; later ed. 1897) is perhaps the best brief popular account of the various campaigns of 1861-65. His *Campaign of Chancellorsville* (1881) has also been highly commended. Besides many articles for the magazines, he has also published: *Patroclus and Penelope: A Chat in the Saddle* (1883); *Great Captains* (1886); *Riders of Many Lands* (1893); *Alexander* (1888); *Hannibal* (1889); *Cæsar* (1892); *Gustavus Adolphus* (1896); and *Napoleon* (1904), the last five works forming part of a projected history of the art of war, to be completed in six volumes.

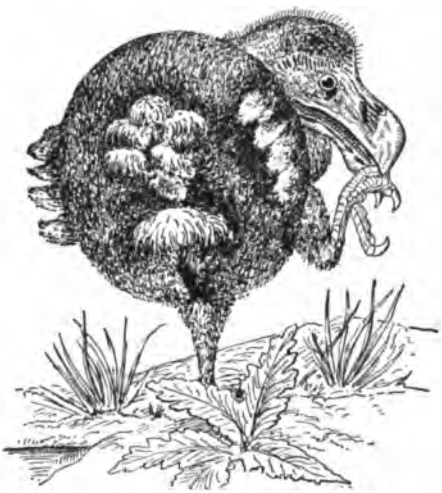
DODGE, William Earl (1804-83). An American merchant and philanthropist. He was born in Hartford, Conn.; was educated in the public schools, and worked for a short time in his father's cotton-mill near Norwich. Removing to New York with his father, he entered a wholesale dry-goods store, and finally, after eight years, went into business by himself. In 1833 he became a member of the firm of Phelps, Dodge & Co. He became interested in railroad and insurance corporations, and invested largely in mines and wood-lands. He was interested in temperance and religious work and was one of the most generous supporters of the Young Men's Christian Association and the Freedmen's Bureau. He was a member of the peace convention of 1861, and was a Republican member of Congress in 1866. President Grant appointed him a member of the Indian Commission. At his death he left large bequests to religious and charitable institutions. Consult Martin, *William E. Dodge, the Christian Merchant* (New York, 1890).

DODGE′VILLE. A city and the county-seat of Iowa County, Wis., 47 miles west by south of Madison, on the Chicago and Northwestern and the Illinois Central railroads (Map: Wisconsin, C 6). Deposits of lead and zinc occur in the vicinity, and the city has considerable trade in live stock, agricultural and dairy products, and manufactures of wagons, plows, canned goods, flour, etc. In the district are several creameries conducted on the coöperative plan. Dodgeville was the early home of the Territorial Governor Dodge, from whom it is named. Population, 1900, 1865; 1905, 2152.

DODGSON, dŏj′son, Charles Lutwidge (1832-98). An English author, best known by his pseudonym, Lewis Carroll. He was born in the village of Daresbury, near Warrington (Chester), England. Educated at Oxford, he took deacon's orders in 1861, and from 1855 to 1881 he was mathematical lecturer at Christ Church. He was an acute mathematician, with a penchant for the intricate and ingenious, and made to mathematical literature a contribution of high rank in his *Euclid and His Modern Rivals* (1879), eccentrically cast in dramatic mold and interspersed with jokes. His further publications in this department include a *Syllabus of Plane Algebraical Geometry* (1860) and *An Elementary Treatise on Determinants* (1867). But he is best known as the originator of a unique literary genre in his *Alice's Adventures in Wonderland* (1865), with its continuation in *Through the Looking-Glass and What Alice Found There* (1871), both admirably illustrated by Sir John Tenniel. These books display a delightful combination of mad absurdity and subtle fancy. Their grotesque situations compose a peculiar literary tradition. *The Hunting of the Snark* (1876), an episode none the less enjoyable because its meaning remains unsolved, was nearly as successful. *Sylvie and Bruno* (1889) and *Sylvie and Bruno Concluded* (1893) were inferior to the previous works. A dramatization of the Alice volumes by Saville Clarke was presented in London in 1886. For a good account of Dodgson's interesting personality, consult the *Life and Letters*, edited by Collingwood (London, 1898).

DOD′INGTON, George Bubb, Baron Melcombe (1691-1762). An English politician. He was the son of Jeremiah Bubb, but took the name of Dodington in 1720, on inheriting a large estate from an uncle of that name. He was educated, it is said, at Oxford, was elected member of Parliament for Winchelsea in 1715, and in the same year was appointed envoy extraordinary to Spain, remaining at Madrid until 1717. He became very wealthy, and controlled five or six votes in Parliament, which made his friendship much sought after by the politicians of the day. Dodington had an inordinate desire to become himself a power in politics and to be elevated to the peerage, and bartered away his votes first to one party and then to another, according to the size of the promises made him, and the possibility of their being fulfilled. He entered politics as a follower of Walpole, deserted to the Prince of Wales, and was later allied in turn to Argyll, Henry Pelham, Newcastle, and Bute. His variability in politics and the venality of his half-dozen votes made him the frequent butt of political satire and caricature. He was a Lord of the Treasury from 1724 to 1740, became Treasurer of the Navy under Henry Pelham in 1744, and in 1755 held the same position under the Newcastle-Fox coalition. For his support of Lord Bute in 1761, he was rewarded by being created Baron Melcombe of Melcombe Regis, Dorsetshire. Dodington was one of the last of the 'patrons,' and gathered about him some of the best-known literary men of the time, including Young, Thomson, and Fielding. His *Diary*, published in 1784, gives an interesting picture of the political and social life of the times.

DODO (Neo-Lat. *didus*, Port. *doudo*, simpleton, possibly connected with Devonshire, Engl. *dold*, dolt, lit. dulled, from *dull*), or Dronte (Dutch, of unknown origin, bloated). An extinct bird (*Didus ineptus*) of Mauritius, allied to the pigeons, and representing a family Dididæ, which was confined to the Mauritius, Rodriguez, and Bourbon group of islands, and became extinct toward the end of the seventeenth century. It is described by several voyagers of the sixteenth and seventeenth centuries, who also spoke of it as 'walghvogel' and 'dronte,' and seems even to have been brought alive to Europe. The descriptions of those who saw it are confirmed by several more or less rude drawings preserved in various European libraries and museums, especially in Holland. These represent a bird larger than a swan; of a very heavy and clumsy form and a corresponding gait, with short, thick, scale-covered legs; three rather short toes before and one behind; large head; very large bill, the upper mandible longer than the under, and much hooked at the point; the wings so short as to be of no use for flight, and furnished only with a few black feathers; the general plumage a kind of grayish down; the tail merely a tuft or bunch of curiously curled feathers. The dodo was so abundant when some of the first voyagers visited Mauritius that they became satiated with its flesh, which they describe, particularly the breast, as good. The birds were easily killed, being wholly unable to fly, and running slowly. Their speedy extinction after the islands began to be visited and settled is thus easily accounted for; yet it seems to have been due to the increase of pigs, running loose upon the island, rather than directly to man. The dodo seems to have been adapted for living in tropical woods, where the luxuriant vegetation afforded it a ready supply of food, and its powerful hooked beak was adapted to tearing vegetable and not animal substances. One traveler asserts that these birds uttered a cry like a gosling, and laid a single large white egg on a mass of grass in the woods. Consult: Newton, *Dictionary of Birds* (London, 1896); *Annual Report United States National Museum* (Washington, 1889); Von Frauenfeld, *Neu Aufgefundene Abbildung des Dronte* (Vienna, 1868); Strickland, *The Dodo and Its Kindred* (London, 1848). Compare Solitaire. See Extinct Animals.



DODO.
(After an old print in the British Museum.)

DODO'NA (Lat., from Gk. Δωδώνη, *Dōdōnē*). An ancient city of Epirus. It was situated in a fertile valley about 11 miles southwest of the site of the modern Janina, on a hill projecting from Mount Tomarus, and surrounded by rugged mountains. It was the seat of a very ancient oracle and cult of Zeus (surnamed the Pelasgian), Dione, and Aphrodite. In Homer the prophets are called Selloi or more probably Helloi, but later we hear of three priestesses, the Peleiades, or 'doves.' A local legend is said to attribute the origin of the oracle to a black dove, which spoke with human voice from one of the neighboring oaks. The divine will was manifested by the rustling of the leaves in an oak-grove, by the ringing echoes from a bronze tripod, struck by the metal-tipped lashes of a whip rustling in the wind, and by the gushing or rippling of a fountain. It seems, indeed, that new methods of prophecy were introduced to compete with the rival oracle at Delphi. In the fifth century B.C. it enjoyed great credit, and was consulted by Spartans and Athenians, but later it waned in importance and was sacked by Ætolians (B.C. 219) and Romans. In A.D. 516 a bishop of Dodona is mentioned, but after that the place disappears from history, and the very site was uncertain until the excavations of Carapanos in 1878. These brought to light a fortified acropolis, a theatre, and the sacred precinct, containing temples of Zeus and Aphrodite, and other buildings connected with the oracle. Many small votive figures were discovered, and a number of leaden tablets, containing questions addressed to the oracle, or, very rarely, an answer. Consult: Carapanos, *Dodone et ses ruines* (Paris, 1878); Diehl, *Excursions in Greece* (London, 1893); Gardner, *New Chapters in Greek History* (London, 1892); Wachnig, *De oraculo Dodonæo* (Breslau, 1885).

DODS, Marcus (1834—). A divine of the Scotch United Free Church. He was born at Belford, Northumberland, took his master's degree at Edinburgh in 1854 and studied divinity at New College, 1854-58. He was pastor of Renfield Free Church, Glasgow, 1864-89, and in 1889 became professor of New Testament theology in New College, Edinburgh. Besides commentaries on Genesis (1882), Haggai, Zachariah, and Malachi (1879), I. Corinthians and Thessalonians (1882), the notes on the Gospel of John in the *Expositor's Greek Testament* (1897), and the expositions of Genesis, John, and I. Corinthians in the *Expositor's Bible*, he published *The Prayer that Teaches to Pray*, 1863; *Epistles to the Seven Churches* (1865); *The Parables of Our Lord* (2 series, 1883-85); *Israel's Iron Age* (1874); *Mohammed, Buddha, and Christ* (1877); *Introduction to the New Testament* (1888); *Erasmus and Other Essays* (1891); *Why Be Religious?* (1897); *How to become like Christ* (1897); *Forerunners of Dante* (1903); *The Bible: Its Origin and Nature* (1905).

DODS, Meg. The despotic landlady of the Mowbray Arms, a well-drawn low-comedy character, in Scott's *Saint Ronan's Well.*

DODS′LEY, Robert (1703-64). An English author and publisher. He was born near Mansfield, in Nottingham. His father, who was a schoolmaster, apprenticed him to a stocking-weaver; but finding this employment disagreeble, Dodsley ran away, and was afterwards engaged as footman. While thus employed he began to write verses on the behavior of servants, publishing, in 1732, a volume entitled *The Muse in Livery, or the Footman's Miscellany.* His next production—*The Toy Shop,* a dramatic piece—was performed in 1735 at Covent Garden Theatre with great success. With the profits from his books and play, and with the aid of Pope, Dodsley began business as a bookseller, in which trade he was very successful. In 1737 his *King and the Miller of Mansfield* was brought out at Drury Lane, and met with an enthusiastic reception. This was followed by *Sir John Cockle at Court, The Blind Beggar of Bethnal Green,* and *Rex et Pontifex,* which were republished in a collected edition of his dramatic works with the title of *Trifles* (1748). His dramatic career closed with a tragedy called *Cleone* (1758), acted at Covent Garden with extraordinary success. Meantime, he was conducting his business with great ability and spirit. In 1738 he bought Johnson's *London* for ten guineas. He became the publisher of other famous authors—Pope, Young, Walpole, and Goldsmith. Though he carried through many other literary schemes, he is chiefly remembered now on account of his *Select Collection of Old Plays* (12 vols., 1744), of which there have been four editions, the last being edited by Hazlitt (15 vols., 1874-76). Another valuable publication was *Collection of Poems by Several Hands* (4 vols., 1784-49). Consult: Knight, *Shadows of the Old Booksellers* (London, 1865).

DOD′SON. In George Eliot's *Mill on the Floss,* the name of three prim but admirable old aunts, who judge everything by the standard of their amusing family peculiarities.

DODSON, James (?-1757). An English mathematician, the great-grandfather of A. De Morgan. The date of his birth is unknown, nor is anything known of his early life. It is, however, certain that he was over forty-seven years of age at the time of his death. He was a fellow of the Royal Society (1755) and master of the Royal Mathematical School, Christ's Hospital (1755). Dodson is known chiefly for his *Anti-Logarithmic Canon* (1742), the manuscript of which was probably due to Warner and Pell (about 1630-40), and for *The Mathematical Miscellany.* The latter was published in three volumes (1747-55), and was devoted to the consideration of problems. Besides these works, he published the *Calculator* (1747), a collection of small tables; the *Accountant* (1750), a work on bookkeeping; a new edition of Wingate's *Arithmetic* (1751); and he joined with Mountaine in a geographical work published (1758) after his death. He also interested himself in life insurance and annuities.

DODSON, John E. (1857—). A comedian, born in England, who came to the United States with the Kendals in 1889 and is especially known in 'character' parts. He made his début in 1877 at Manchester with J. L. Toole in *The Spelling Bee.* Later he played for several seasons at Dublin and in different Scottish and English cities, supporting, among other 'stars,' Charles Mathews, Barry Sullivan, Joseph Jefferson, and J. K. Emmett. One of his creations was Carraway Bones in *Turned Up.* After he joined the Kendals' company he appeared in *A Scrap of Paper, The Ironmaster, The Squire, The Second Mrs. Tanqueray, Still Waters Run Deep,* and other plays. In 1894 he became a member of Charles Frohman's company, playing in *The Masqueraders, John-a-Dreams,* etc. In 1898 he made a hit as old John Weathersby in Gillette's farce, *Because She Loved Him So.*

DODSON AND FOGG. A rascally firm of legal advisers in Dickens's *Pickwick Papers.* They inveigle Mrs. Bardell into the famous breach-of-promise suit, 'Bardell vs. Pickwick,' and when about to lose their fees by the defendant's firmness, land their client in jail, whence she is released by the sympathetic Mr. Pickwick, who pays the costs.

DOD′WELL, Edward (1767-1832). An English archæologist. He graduated at Trinity College, Cambridge, in 1800, and devoted his life to archæological research in Greece and Rome. He discovered many valuable antiquities in Attica and in the vicinity of Corinth, and procured the well-known Dodwell Vase, now in the Munich Glyptothek. Among his publications are: *A Classical and Topographical Tour Through Greece* (1819); *Views in Greece from Drawings by Edward Dodwell* (1821); and *Views and Descriptions of Cyclopean and Pelasgic Remains in Italy and Greece* (1834).

DODWELL, Henry (1641-1711). An English historian and theologian. He was born in Dublin, where he studied at Trinity College, in which for some years he held a fellowship. In 1688 he was elected Camden professor of history at Oxford, but in 1691 he was deprived of his professorship for refusing to take the oath of allegiance to William and Mary, and afterwards devoted himself to literary pursuits. As a theologian, he attracted much attention by his advocacy of various eccentric theories and was involved in several animated controversies. His learning as a chronologist was praised by Gibbon, who, however, berates him for his method and style. Among his publications are: *Book of Schism; Annales Thucydideani* (1696); *Annales Velleiani, Quintiliani* (1698); *An Account of the Lesser Geographers* (1698-1712); *De Cyclis* (1702); a treatise *Against Occasional Communion* (1705); and *Parænesis to Foreigners Concerning the Late English Schism* (1704).

DOE, John. The assumed name of the fictitious plaintiff in the common-law action of ejectment (q.v.), hence, in any other action in which the name of the real plaintiff is withheld. Where a fictitious name is desired for a defendant Richard Roe is commonly employed. These names are of great antiquity and nothing is known of their origin. It is probable, however, that John Doe was the real name of a clerk or other minor official of the Court of King's Bench in which the action of ejectment originated, and who lent himself regularly to the fiction upon which the action was based. In some of the American States other names were substituted for John Doe, as 'Jackson' in New York and 'Den' in New Jersey. But John Doe continues to be a popular and convenient anonym for the concealment of personal identity.

DOEBIRD, or Doughbird. The Eskimo curlew. See Curlew.

DO'EG. An Edomitish servant of Saul, probably keeper of his asses (I. Sam. xxi. 7; xxii. 9). He had lingered in the sacred precincts of Nob and noticed David's intercourse with the priest Ahimelech. When he informed Saul of this, the King ordered his warriors to put Ahimelech and the other priests of Nob to death. Upon their refusal to do so, Doeg performed the deed (I. Sam. xxii. 9-18). Doeg is also mentioned in a late superscription to Psalm lii., but the psalm itself was probably not written before the beginning of the second century B.C.

DOEG. A character in Dryden's *Absalom and Achitophel*, a caricature on the youthful playwright Elkanah Settle, who had gained the laureate's ill will.

DOES, dōōs, Jakob van der (the elder) (1623-73). A Dutch painter, born in Amsterdam. He studied with Nicolas Moyaert and then went to France and Italy, where he lived for some time. His pictures are of landscapes with sheep and goats, the backgrounds often scenes near Rome. His coloring is dark and sometimes dry, but much of his work has merit. The galleries of Vienna, Brussels, and Munich possess pictures by him. His son Jakob (1654-99) was the pupil of Karel du Jardin and Kaspar Netscher and painted historical pictures. Another son, Simon (1653-1717), was the pupil of his father, and also studied under Adriaen van der Velde. His work is in landscape, figures, and portraits.

DOFFER (from *doff*, ME. *doffe*, from *do* + *off*). That part of a carding-machine which takes the wool or cotton from the cylinder when carded. See Carding.

DOG (AS. *docga*). A carnivorous mammal of the family Canidæ, especially the genus Canis, and more specifically one that is domesticated. The dog, or dogs, considered as a subject for present purposes, requires treatment from several points of view, namely:

1. As a tribe, in its zoölogical relations.
2. As a more limited group, according to the ordinary acceptation of the term 'dog.'
3. As to the relation of domestic dogs to mankind.

The dog tribe includes the whole of the carnivorous family Canidæ, for the zoölogical history and character of which see Canidæ. It embraces a variety of forms which are divisible into at least five groups:

(a) The long-eared fox-dog (Otocyon) of South Africa, which is the most generalized member of the family. See Fox-Dog; Otocyon.

(b) The bush-dog (Icticyon) of South America, a specialized aberrant form. See Bush-Dog.

(c) The foxes, forming what Huxley called the alopecoid or vulpine series, and embracing the typical foxes, fennecs, corsacs, kit foxes, etc. See Fox; Fennec, etc.

(d) The hunting-dog (Lycaon) of South Africa. See Hunting-Dog.

(e) The wolves, forming Huxley's thoöid or lupine series, in which are found the wolves, jackals, fox-dogs, crab-eating dog, and similar wild and domestic 'dogs' of the world.

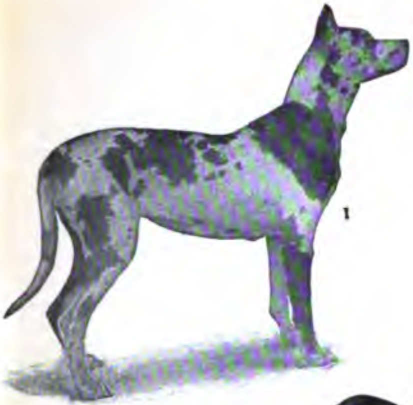
The first four of these subjects are treated of elsewhere, as indicated by the cross-references noted above. In the last group (e), wolves, jackals, fox-dogs, etc., many of the individual forms are separately described under their names. There remain then for consideration here: (1) a group which may properly be designated wild dogs, and (2) the domestic dogs.

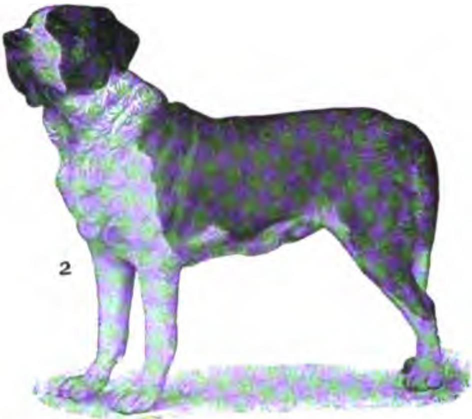
Wild Dogs. There exist in southeastern Asia and in Australia three or four species of canine animals which are hardly separable from the genus Canis by distinct characters of importance, yet which seem to form a natural group that may be consistently separated as a genus or subgenus Cyon, characterized mainly by the lack of the small last tubercular molar tooth on each side of the lower jaw (as was the case with fossil Cynodictis), by having a comparatively short muzzle, slightly convex facial outline, rather short legs, with long hair between the footpads, and 12 to 14 mammæ instead of the normal ten. The dingo may, for the present, be included in this group. Their resemblance in general is to jackals, of which Huxley considers them a locally modified type, but they have a more 'doggy' appearance than either jackals or wolves. It is from this resemblance that the designation 'wild dogs' arises, and not from the belief that any of them is a direct progenitor of modern domestic dogs, even though individuals of all of them may occasionally have been tamed and attached to human owners. There is much general resemblance among them. In size they somewhat exceed the jackals, being from 30 to 38 inches long exclusive of the tail, which in all is long (about two-fifths of the length of the body) and bushy, like that of a jackal or a fox. All have comparatively long and coarse hair, the prevailing color of which is rust-red in summer and lighter in winter, and generally decidedly darker on the back and tail than on the chest, belly, and inside of the legs. They go abroad in the daytime rather more than at night, hunt in packs of a dozen or more, led by an old male; and dwell by families, sometimes polygamous, in crevices of rocks, hollow trees and similar retreats, but they do not dig burrows.

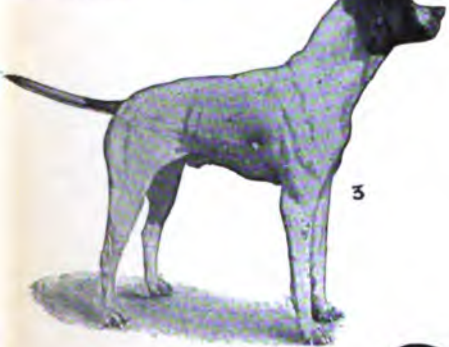
The best known of these is the Indian wild dog (*Canis*, or *Cyon, Deccanensis*), which inhabits the forested parts of the whole Himalayan region, the treeless area of eastern Tibet, and southward as far as the great forests of India. The more southerly form, known as the *dhole* in the far south of the peninsula, *sona kuta* (golden dog) in central India, and *kolsun* among the Mahrattas, has been set apart by some students (see Mivart, *Proceedings of the Zoölogical Society of London*, 1890, p. 88) as a separate species (*Canis primævus*), but the distinction is much doubted. The native name of the northern form is 'buansu,' to which the reader is referred for further particulars.

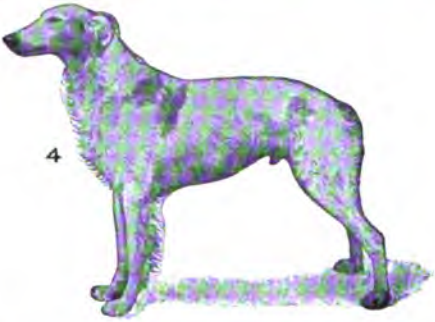
The Malay wild dog (*Canis rutilans*) is a rather smaller species, which occurs east of Bengal throughout the Malay Peninsula, and also in Java, Sumatra, and perhaps Borneo. Whether the wild dog of upper Burma belongs to this or the preceding species is dubious, and this doubt lends color to the opinion of some naturalists that these Eastern forms are not specifically separate from the Indian one. Blanford regards the Malay dog as distinct and describes it as smaller, more slender in body and limbs, with shorter and harsher hair, a deep ferruginous red. Its habits in general seem to be those of the Indian dog.

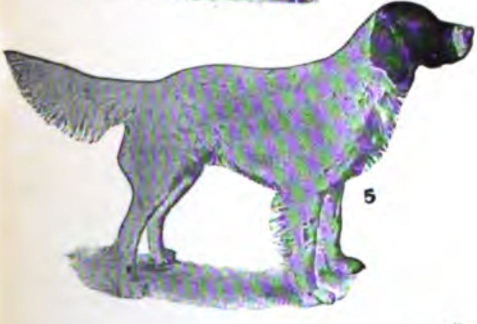
HUNTING AND WATCH DOGS

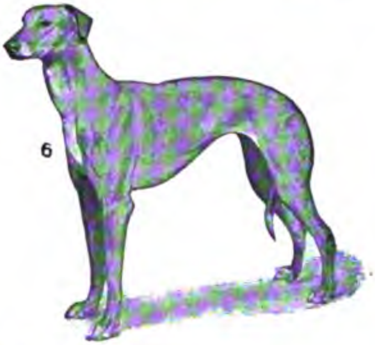

1

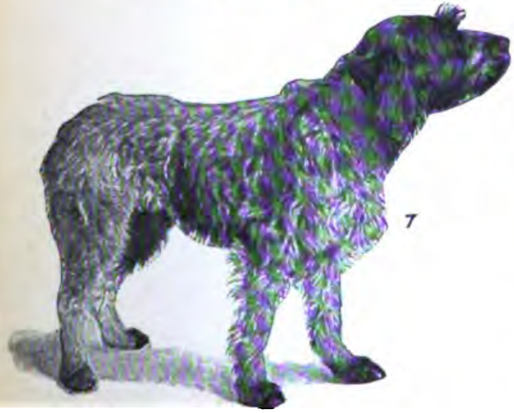

2

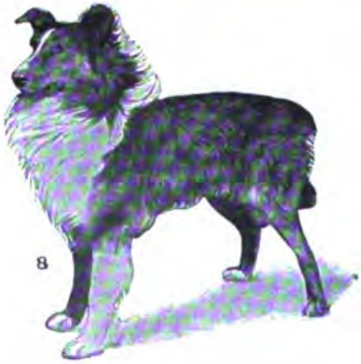

3


4


5


6


7


8

1. **GREAT DANE, "Monticello Pearl."**
2. **ST. BERNARD, "Prince Napoleon."**
3. **POINTER, "Champion Boy."**
4. **RUSSIAN WOLFHOUND, "Marksman."**
5. **ENGLISH SETTER, "Knight Errant."**
6. **GREYHOUND, "Leeds Music."**
7. **GRIFFON, "Blitz von Kaiserlauten."**
8. **COLLIE, "Emerald Eclipse."**

The Siberian wild dog (*Canis alpinus*) much resembles the others in features and habits. It inhabits the forested regions of northern Asia as far south as the Altai Mountains, and subsists almost entirely on deer, which it hunts in companies, pursuing them so constantly that it is said occasionally to destroy or drive away all the deer in certain districts. It also hunts the ibex in the high mountains. It appears that this semi-arctic dog changes its summer coat of fox-red for a long and woolly winter dress of yellowish white, as do the arctic foxes.

There remains to be mentioned the dingo (*Canis dingo*), which by some naturalists has been set apart in a genus (Dingo) by itself. It inhabits Australia only, and bears a considerable resemblance to the Himalayan wild dog. Although numerous in wild packs, it is also kept domesticated by the native Australians, by whose remote ancestors it may have been introduced into that island from the North. See DINGO.

INTERBREEDING, TAMABILITY, AND VOICE. A few special considerations may well be made at this point, as tending to illuminate the relation which domestic dogs bear to the wild forms. First, it appears certain, although it may almost never occur under natural conditions, where the primal instincts of kinship prevent crossing of 'species,' that all the various canine animals may interbreed and produce offspring. This has been accomplished in the case of some species in captivity or a state of semi-domestication. Whether these hybrid offspring are fertile with each other in every case, or usually, is not so certain. A few instances are recorded in which they have been found to be so.

In respect to tamability, canine animals are much superior as a tribe to feline animals, and perhaps no species intelligently tried has proved intractable. Pet examples of almost every species have been found among the savage or partly civilized peoples of the world, and the owners of menageries find even wolves submitting well to the trainers. There seems to be in the canine nature, disposing them to gather in packs and hunt in concert, and strengthened by these practices, a sympathetic element wanting in most other carnivores, the cultivation of which by man has led to the close affiliation between him and his dog, and to the expansion of the dog nature into the beautiful fidelity, appreciation, and affection it exhibits in its higher examples.

Wild canines may be said to howl, to yelp, to whine, to growl, and even—as some have mentioned—to bay when pursuing quarry; but none truly barks. Much attention was paid to this point by Mr. Bartlett, for many years keeper of the Zoölogical Gardens of London, who concluded from his observation of the captives, of many wild species, under his care, that the barking of domestic dogs is an acquired habit, but one into which wild canines quickly fall by imitation. "A well-known instance of this," Mr. Bartlett wrote (*Proceedings of the Zoölogical Society of London*, 1890), "occurred under my notice. A wild antarctic wolf, after a few months, hearing the barking of dogs in the immediate neighborhood, began to bark, and succeeded admirably. The same thing has happened to my knowledge in the case of pure-bred Eskimo dogs and dingos." See Plates of WOLVES AND WILD DOGS; and FOXES AND JACKALS.

FOSSIL DOGS. The ancestors of the dogs, wolves, foxes, and jackals may be traced back through the Pliocene into the Miocene and Eocene periods, beyond which the ancestral forms become so generalized in type that they can with difficulty be placed in their respective categories, or separated from the ancestors of the civets and bears. Indeed, these families, together with the Canidæ, had a common origin in the Eocene carnivores, such as Amphicyon, Calecynus, Cynodictis, which are synthetic types. The modern family of Canidæ is a diphyletic group, i. e. it has had two sources. One series, terminating in the jackal, is thought to have had a common origin with the Viverridæ in Cynodictis. The second series, comprising the true dogs, foxes, and wolves, traces its ancestry from Daphænus and the earlier Amphicyon, which latter also gave rise to the bears.

ORIGIN OF DOMESTIC DOGS. A great amount of discussion has taken place over the question of the origin of domestic dogs—whether they represent a separate species, or are the descendants of some existing canine species, or are of composite stock. The present diversity is so great that some dogs are no larger than the heads of others; that some are almost totally hairless, while others wear coats of hair longer than is elsewhere known among mammals, and some have narrow skulls with prolonged jaws, while in others the width of the skull is greater than its antero-posterior length, and the jaws hardly protrude beyond the forehead. Equally remarkable differences separate them temperamentally. The question then arose: Could all these variations be accounted for as the result of domestication and selective breeding acting upon a single species; and, if so, what traces remained to indicate what that species is, or was? It would be unprofitable to enter into all the speculations that have been recorded. Some have held that our dogs were only modified descendants of a wolf, the same or essentially similar to the modern common wolf; others, that all dogs are modified jackals. It has been extremely difficult for either school to find characteristics held in common by all varieties of dogs by which to make their comparisons and support their arguments. The up-curling of the tail, the drooping of the ears, the presence of 'buttons' of tan over the eyes, and other alleged characteristics are not universal, and seem comparatively unimportant. Probably the most singular characteristic possessed by dogs as contrasted with wild canines of every sort is a matter of voice—the bark; but those on the borderland of dogdom, such as the Arctic sledge-dogs and the dingo, do not utter this peculiar sound, and, on the other hand, dingos, Eskimo dogs, and even wild canines, quickly acquire the habit when associated with tame dogs, by imitating them more or less completely. See DINGO.

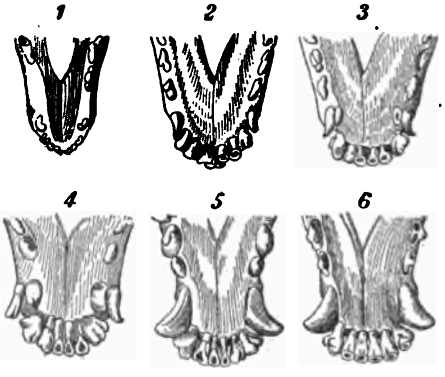
The consensus of modern scientific opinion is that our dogs represent the union of several strains, which during the long ages since this animal began to associate with wandering mankind, have been intermixed until only an indefinite trace of the original wild ancestry can be found; and that this process has continued to the present time. An important element, no doubt, is wolf; an equally important element, jackal. Foxes seem to have had a less part in the mixture, but the former assertion that foxes were unable to cross-breed with dogs is now known to be erroneous; such hybrids are uncommon, but do exist, and are no less fertile than other canine crosses, such, for instance, as those between domestic dogs and wolves or jackals, which constantly happen on the frontier of civilization, both by accident and by intention on the part of the owners. But it must be remembered that wolves and jackals are of various species and exist in many parts of the world, and that there are various other members of the dog family, such as the 'wild dogs' of the Orient, described earlier in this article, the foxes, and the fox-dogs and wolves of South America. Moreover, sufficient time has elapsed in all probability since the domestic races began for species of a smaller sort to have become extinct, perhaps largely through man's agency, partly by killing them, and partly by absorbing them into his domestic family. The peculiarities of certain races, such as the Japanese pugs and the hairless dogs of tropical America, are so great as to be accounted for with difficulty, except upon the supposition that they are the descendants of extinct species.

All canine animals exhibit, more or less plainly, the qualities which have contributed to make the character and value of the domestic dog what they are. They are courageous, quick-witted, and accustomed to possessing and defending home and property (their captures), and to the exercise of both nose and eyes, whose faculties are highly developed. More important, however, as rendering them susceptible to taming and the offer of human friendship, is their practice of hunting in companies and aiding one another, which has developed in them a social disposition much in excess of that in any other class of carnivores, and given them a sense of mutual dependence easily transferred to human companions and increased by continual human association. Hence the fact that in every part of the world, and from time immemorial, men have been found to own dogs, and the history of the dispersion of his dogs is bound up with the problem of the dispersion of man himself. The practice appears as far back as humanity can be traced. We may not be sure that Paleolithic man kept dogs as camp-mates, but 'Neolithic' man, he of the stone village on the hill and of the pile-built dwelling on the lake, certainly possessed and used them as an aid in keeping his flocks and herds. The oldest monumental remains of the valleys of the Indus, the Euphrates, and the Nile, show that dogs were common among these early peoples and in great diversity. Certain types well known to-day may be recognized, and will be referred to more particularly in the special articles on those breeds. Consult Berjeau, *The Varieties of Dogs* (London, 1865), a treatise upon dogs as they are found depicted in old sculptures, pictures, engravings, and books to the end of the seventeenth century.

It is certain that the first ones tamed were of local species, some of which in all probability have since become extinct. As tribes enlarged and spread out, their dogs would go with them. Here and there they would encounter and coalesce with other peoples and an intermingling of dogs would follow. This, going on indefinitely and complicated by constant intermixture with new blood from the forest—for in no group of animals is interfertility more general—would speedily bring about a great variety of forms. In addition to this, however, there must have gone on from the very first, besides the varying influences of new climate, food, and general environment, a certain amount of selective breeding.

It has been held by Professor Shaler and others that the first motive leading to domestication of the dog was to provide a resource against the recurring famines that afflict aboriginal life, while others suppose the animal's aid in hunting first made it valuable. Undoubtedly, then as now, the dog was eaten on occasion, but it would certainly make itself so useful as a watch-dog and a hunter as quickly to win regard; and there is no doubt that the personality of the animal would appeal to the affection of the primeval savages as it does to-day. No other human beings are regarded as so rude and autochthonous as the northern Australians, yet while they eat both the wild and tame dingos, and use the latter in hunting, they regard many of them as pets, lavish affection upon them, and even nurse the puppies at the women's breasts. In recognition of these qualities, the best or most interesting puppies and older dogs would naturally be saved when any were to be killed for food or other purpose. In such isolated circumstances as those of the Australians, where there is free and constant intercourse between the wild stock and the tame, this would have little effect; but in general, where the mixture of several wild breeds had already produced diverse hybrids, the unconscious selection thus brought about would soon be effective, and would be followed, as civilization began, with a more intelligent and definite kind of choice, which must have originated selective breeding long before any history of it begins. It must have been intelligently and persistently practiced, in fact, long before the earliest civilized records, for monuments inscribed four or five thousand years ago bear pictures of widely diversified and perfectly bred races of dogs, such as greyhounds.

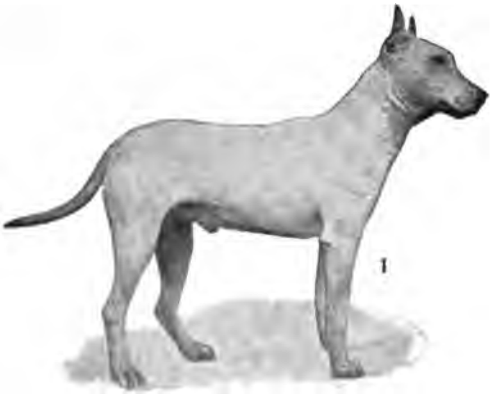
VARIETIES OF DOMESTIC DOGS. No one probably has ever attempted to make a complete catalogue of the varieties of domestic dogs known throughout the world, but Fitzinger estimated the number in 1876 at about 185. All these fall into certain groups, or types, as will presently be noted; and the study of their points of likeness and unlikeness has been made by several recent investi-

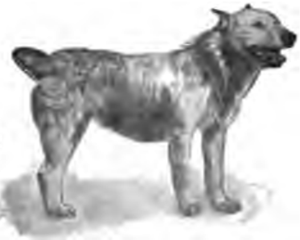


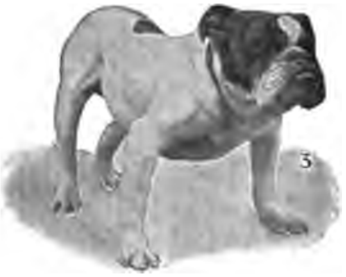
GROWTH OF A DOG'S TEETH.

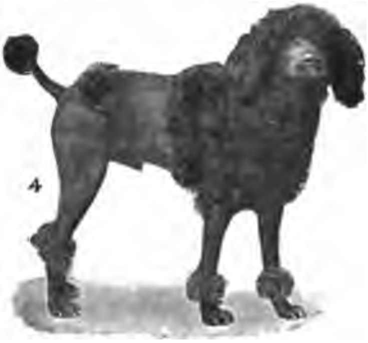
Development of dentition in the lower jaw at various successive ages: 1, two days; 2, four months; 3, six months; 4, nine months; 5, eleven months; 6, four years.

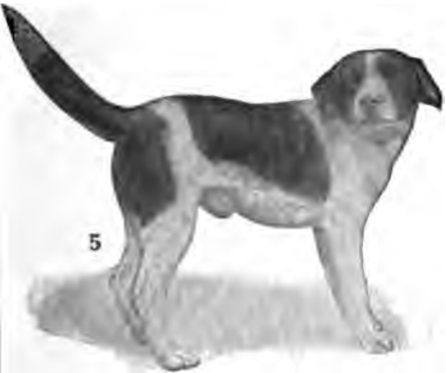
TERRIERS, SPANIELS, ETC.

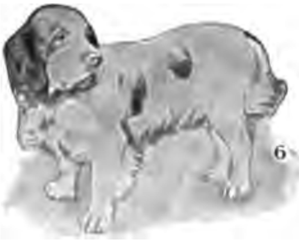

1

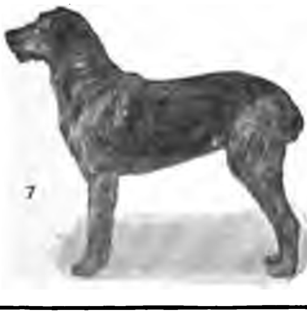

2

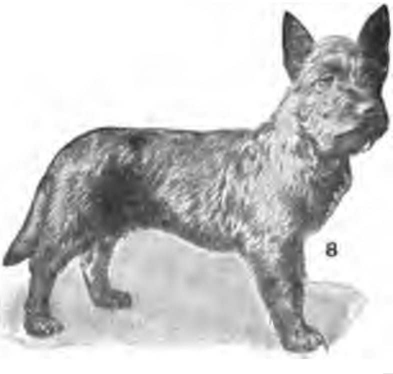

3


4


5


6


7


8

1. BULL TERRIER, "Woodcock Wonder."
2. AIREDALE TERRIER.
3. ENGLISH BULLDOG, "Katerfelto."
4. POODLE, "Milo Boy."
5. BEAGLE, "Primate."
6. CLUMBER SPANIEL "Medway."
7. IRISH TERRIER.
8. SCOTCH TERRIER, "Adora Alexander."

gators of the law of variation. One of the most recent and successful of these was a comparison by Windle of the skulls of some 60 varieties, representing most of the types, the results of which were extensively tabulated and discussed in the *Proceedings of the Zoölogical Society of London* for 1890. He says that the most noteworthy fact learned from his comparative measurements of dog-crania was that the averages of the different breeds, especially in points relating to some of the teeth, differ very little from one another; in other words, that, speaking generally, the teeth in one dog are relatively to the skull very similar in size to those of any other. It is also to be noticed that the range of variation in any breed is much greater, in almost every case, than that existing between any two breeds. Mr. Windle says:

"The extreme variations in any breed are probably due to the fact that, strictly speaking, so few animals of the same group are really in any sense of the same breed. The various members of a carefully selected strain of terriers, for example, bred by one breeder, might be comparable with one another, and yet quite different in descent from another and perhaps equally good strain belonging to another breeder and to another part of the country. With dogs bred for show purposes, as so many of the pure strains are, and with constantly varying requirements of fashion, all sorts of crosses, as any manual of dog-breeding will show, have been tried with a view of attaining the ideal, whether of symmetry, pace, or carriage. That such crosses should, at times at least, leave their marks upon the skulls, and cause differences in breeds which cannot be accounted for, is, of course, to be expected. The presence of the disturbing factor can be appreciated, though its exact nature cannot always or even frequently be ascertained with any correctness. Thus amongst the eleven bulldogs' skulls which we have examined, there was one which differed in measurements considerably from the rest. It was nearly one centimeter longer than any other, and, what is much more significant, it was seven centimeters longer than it was broad, the average for the others being about three or four centimeters. Moreover, its palate was 1.90 centimeters longer than it was broad, whilst in every other case but one the breadth exceeded the length. In the second case, the length was .90 greater than the breadth of the palate, and the length of the skull nearly five centimeters greater than the zygomatic width. We cannot doubt that both of the skulls above mentioned were those of dogs in whom, to a greater or lesser degree, there was an admixture of strain, of what kind it is impossible to say. And what is true of these is doubtless true also in lesser degree of the greater number of specimens coming under examination. It thus becomes apparently a hopeless task to look for evidence as to the proximate or ultimate derivation of the breeds of domestic dogs in their skulls or teeth."

Having arranged his skulls with reference to relative length and breadth, Mr. Windle found that the distinctly broad-headed dogs form a well-marked group by themselves, including the Chinese pug-nosed spaniel, the pug, bulldog, black-and-tan toy terrier, and King Charles spaniel, a considerable interval existing between these and the next. All these are highly artificial breeds, which require great care and attention in order to prevent deterioration, with its consequent elongation of the skull. Next to this group comes one, largely consisting of terriers, with heads inclining to be broad. A miscellaneous group next follows, gradually decreasing to the distinctly narrow-headed dogs, such as the Irish wolf-dog and the greyhound.

These investigations demonstrated the fact that in the highly artificial broad-headed dogs elongation of skull and palate is a sign of impure breeding, an evidence of admixture with the broad-headed strain of that of some other and narrower-headed dog. Examples of this may be seen almost any day in the streets in the shape of the half-bred pugs, in which the elongated muzzles present so great a contrast with the short, square faces of their pure-bred cousins. We have no facts before us to prove whether the long-headed dogs, such as greyhounds, tend to become broader when impurely bred, but it is highly probable that they would do so, and consequently that the dogs at both ends of the scale would, under the influence of promiscuous interbreeding, tend to approximate to the average head.

CLASSIFICATION. Breeds of dogs have been variously classified. One Roman grouping mentioned by old writers was into fighters (pugnaces), wise dogs (sagaces), and swift-footed ones (celeres); the sagaces were said to have come from Greece, and the pugnaces from Asia. Another ancient grouping was into house-dogs, sheep-dogs, and sporting-dogs, the last embracing fighters, hounds hunting by scent and hounds hunting by sight. Modern naturalists have substantially agreed upon six groups, with considerable differences in composition, however. Thus Col. Hamilton Smith, about 1830, arranged the list as follows: (1) The wolf-dogs, including the Siberian dog, Eskimo dog, Iceland dog, Newfoundland dog, Nootka dog, sheep-dog, great wolf-dog, great Saint Bernard dog, Pomeranian dog, etc. (2) The watch and cattle dogs, including the German boarhound, Danish dog, matin, dog of the North American Indians, etc. (3) The greyhounds, including the Brinjaree dog, different kinds of greyhound, Irish hound, lurcher, Egyptian street dog, etc. (4) The hounds, including the bloodhound, old southern hound, staghound, foxhound, harrier, beagle, pointer, setter, spaniel, springer, cocker, Blenheim dog, water-dog or poodle, etc. (5) The cur dogs, including the terrier and its allies. (6) The mastiffs, including different kinds of mastiff, the bulldog, pug dog, etc.

The latest arrangement is that by Windle, based upon the shape of the skull and other features, rather than upon form and function, yet not greatly different from its predecessors. It is as follows:

I. *Wolf-like Dogs.*—Arctic sledge-dogs; shepherd dogs (collies); Newfoundland dog; Saint Bernard, rough and smooth, and Pomeranian or Spitz dog.

II. *Greyhounds.*—Old Irish wolf-dog; modern Irish wolf-dog; greyhound; Italian greyhound; West Indian naked dog ('presumably').

III. *Spaniels.*—All varieties.

IV. *Hounds.*—Bloodhound; foxhound; harrier; otter-hound, beagle, pointer, setter, etc. (hunting-dogs).

V. *Mastiffs.*—Mastiffs; bulldogs; pugs, etc. (the 'watch-dogs,' notable, as a class, for the extraordinary range of size).

VI. *Terriers.*—English, Scotch, Irish, and Skye terriers; fox-terriers (pure), black-and-tan terriers, turnspits, and the Oriental Pariah dogs.

For the purposes of this Encyclopædia, the domestic dogs have been grouped, and will be found described under the following headings: Field-Dog; Greyhound; Hairless Dog; Hound; Newfoundland Dog; Poodle; Pug; Saint Bernard Dog; Sheep-Dog; Sledge-Dog; Spaniel; Terrier.

The Dog in Law. The dog occupies an anomalous position in the law. Though not belonging to the animals of a wild nature (*feræ naturæ*), he was not, on the other hand, like most other domestic animals, regarded by the common law as the subject of property—at least, while alive; though it was held in an early case that a man might have a right of property in the skin of a dead dog. He belonged, like the cat, the fox, and the monkey, to animals of a 'base nature.' The utility of certain species of dogs, especially in hunting, gradually gained for them a certain legal recognition, and in the time of Elizabeth we find it laid down that the law takes notice of greyhounds, mastiffs, spaniels, and tumblers, and that an action in trover will lie against any one who takes and detains such a dog from the owner. But the offense was not punishable criminally at common law. By a statute of George III. (1770), however, it was enacted that the stealing of any dog was a misdemeanor, punishable by fine, imprisonment, or whipping. In a few of the United States similar statutes have been passed, but in general the dog retains his inferior common-law status in this country, as not the subject of larceny. In most of the States, however, it is probable that an action in trover would lie for the recovery of a valuable dog, though the question has been passed upon only in a few jurisdictions.

On the other hand, it is generally lawful to keep a dog, and in the absence of general laws or local ordinances to the contrary, to allow him to go at large. The owner is not responsible for injuries caused by his dog unless the latter is of a savage or vicious temper and the owner knew or had reason to believe that the animal was dangerous. In the latter case the owner is absolutely responsible without proof of special negligence on his part. So, if a dog, because of his vicious temper, becomes a common nuisance, the owner may be indicted. And even in a State in which a dog is recognized as property, he may be killed in self-defense, or after due notice to the owner if dangerous to the community. It is common in many jurisdictions to impose a license or other tax on dogs, and in nearly all States the terms on which they may be kept and allowed to run at large are regulated by statute or by municipal ordinances. It is not a violation of the constitutional protection of property in the United States to exterminate dogs in the public interest. See Property; Tort; and consult the authorities there referred to.

Bibliography. Stonehenge, *The Dog*, etc. (see below); Gray, "Varieties of Dogs," in *Annals and Magazine of Natural History*, Series 4, vol. iii. (London, 1869); Huxley, "Cranial and Dental Characters of the Canidæ," in *Proceedings of the Zoölogical Society of London* (London, 1880); Mivart, *Dogs, Jackals, Wolves, and Foxes* (London, 1890); Wortman and Matthew, "The Ancestors of Certain Members of the Canidæ, Viverridæ, and Procyonidæ," *Bulletin of the American Museum of Natural History*, vol. xii. (New York, 1899); Beddard, *Mammalia* (London, 1901). The literature relating to domestic dogs, and especially to those used in the chase, is exceedingly extensive in all languages. A selection of important books in English is as follows: Caius, *De Canibus Britannicis* (*ante* 1572), a Latin essay by a celebrated naturalist of the sixteenth century; George Tuberville, *The Noble Art of Venerie or Hunting* (London, 1576), the earliest illustrated book of the dog; J. H. Walsh ("Stonehenge"), *Dogs of the British Islands* (London); id., *The Dog in Health and Disease* (London, 1859). Standard and modern works: W. Youatt, *Training and Management of the Dog* (London and New York, 1859); Rev. William Pearce ("Idstone"), *The Dog* (London and New York, 1872); Vero Shaw, *Illustrated Dog Book* (London, 1890); Wesley Mills, *The Dog in Health and His Treatment in Disease* (New York, 1892), valuable especially as a veterinary guide; R. B. Lee, *A History and Description of the Modern Dogs* (London, 1897); H. W. Huntington, *The Show Dog* (Providence, 1901).

DOG'BANE (*Apocynum*). A genus of plants of the order Apocynaceæ. Some of the species are shrubby, some herbaceous; some extend into colder climates than is usual for plants of this order. The dogbane of North America (*Apocynum androsæmifolium*) is a perennial herbaceous plant, about four feet high, with smooth stem, much milky juice, smooth ovate leaves, and whitish rose-colored flowers. It grows in open barren places from Georgia to Canada. It is valued for the emetic, diaphoretic, and tonic properties of the bark of its root. The root of Canadian or Indian hemp (*Apocynum cannabinum*) possesses similar properties. This species abounds throughout the western portion of the United States. It furnishes a fine, long, strong, white, easily separable fibre, employed to a considerable extent by the Indians, who manufacture it into numerous articles. (See Apocynum.) For illustration, see Plate Dahlia.

DOGBERRY. A city officer and servile clown in Shakespeare's *Much Ado About Nothing*. He utters the much-quoted phrase, "Write me down an ass."

DOG-DAYS. See Canicula.

DOGE, dōj (It., variant of *duca*, duke, from Lat. *dux*, leader). The name of the chief magistrate in the former republics of Venice and Genoa. The first Doge of Venice, Paola Lucio Anafesto, was elected by the people in 697. Before that time the various islands had been governed by tribunes, but the divided authority had been found inefficient in times of danger. At first the power of the Doge was not strictly defined and depended mainly upon the character of each incumbent, though the consent of the General Assembly was necessary for a declaration of war or the making of a treaty. An able Doge usually endeavored to make his office hereditary, and in order to do this to have his son appointed as consort: but the people resisted this tendency, as they did not wish 'to live under a lord,' and in 1032 the anti-dynastic principle triumphed and the election of the Doge Consort was declared illegal. In order to aid the chief magistrate in his constantly increasing duties, instead of a consort, two *Consiglieri Ducali*, or privy councilors, were appointed. At the same time, as a restriction upon his power, the Doge was obliged to call the more prominent citizens to aid him with their advice. This was the foundation of the Senate, or *Pregadi*. From this time the power of the Doge was gradually restricted by legislative enactment. In the earlier periods, the usual remedy against tyranny had been violence, and several doges had been deposed, blinded, or put to death, but after 1032 tyranny was guarded against by constitutional checks. In 1172 the Great Council, *Maggior Consiglio*, of 480 members was created. These represented the different sections and held office for one year; they made appointments to office and prepared all business which was to go before the General Assembly. In addition the assembly of the *Pregadi* was given greater power, and four more ducal councilors, making six in all, were appointed. Later constitutional changes follow along these same lines. On the one hand, power is taken away from the people as represented in the General Assembly; on the other hand, the influence of the Doge is gradually restricted until he becomes a figurehead, though the pomp and dignity of the office are increased. These changes, however, were made very gradually, and some of the strongest doges ruled during the thirteenth and fourteenth centuries. See DANDOLO.

The people resisted strenuously when the Council attempted to deprive them of the right of electing the Doge. Finally the Council hit upon the expedient of electing the Doge and then presenting him to the people with the following formula: "This is your Doge, if it please you," a formula which was used until 1423. The method of electing the Doge was modified frequently with the purpose of preventing partisanship and corruption. In 1268 the following method was adopted:

The Great Council by lot chose	30	
The 30 were reduced by lot to	9	
The 9 voted for	40	with at least 7 votes each
The 40 were reduced by lot to	12	
The 12 voted for	25	with at least 9 votes each
The 25 were reduced by lot to	9	
The 9 voted for	45	with at least 7 votes each
The 45 were reduced by lot to	11	
The 11 voted for	41	with at least 9 votes each

The 41 elected, with a minimum of twenty-five votes, the Doge.

The power of the Doge was greatly circumscribed, especially after 1229, by making the coronation oath more strict, by the establishment in 1310 of the fearful Council of Ten, and by the appointment of inquisitors to examine in detail all the acts of the deceased Doge. By the coronation oath of Tiepolo, in 1229, he was forbidden to correspond with the Pope, the Emperor, or any other sovereign without the consent of the ducal councilors, and the size of his household was fixed. Loaded down with burdensome conditions and clothed only with empty honors, the office ceased to be sought for. In 1361 the Doge was required to abdicate when asked to do so, but was not allowed to resign of his own accord. A few years later Andrea Contarini was forced to accept the office against his own will, under threat of a confiscation of his property, but in compensation was given a larger household. In 1437 Venice felt the need of a title to the land empire which she had acquired, and the Doge obtained a diploma of investiture from the Emperor, creating him 'Duke of Treviso, Feltre, Belluno, Ceneda, Padua, Brescia, Bergamo, Casalmaggiore, Soncino, and Peschiera.' In spite of his titles, the Doge had little real power in the last centuries of the Republic's existence; the office disappeared with the fall of the Republic in 1797.

The Republic of Genoa elected, after a victory gained by the party of the people, in 1339, Simone Boccanera for its first Doge. In 1396, when Genoa came (for a short time) under the rule of the French, the office of Doge was suppressed. It was revived in 1528, when a new aristocratic constitution was instituted under the auspices of Andrea Doria. In most respects the office was restricted, as in Venice. In 1797, when Genoa was occupied by the French, the office was abolished. It was reëstablished in 1802 for the Ligurian Republic, and again abolished in 1805, when the Republic came to an end. Consult Brown, *Venice* (New York, 1893).

DOGE'S PALACE, THE. The residence for four centuries of the dukes (doges) of Venice, picturesquely situated on the Piazzetta adjoining the Piazza of Saint Mark. It is said to have been founded about 814, and subsequently was destroyed and rebuilt five times. The present reconstruction dates from the time of the Doge Marino Falieri, in the middle of the fourteenth century, the Gothic façade from the first half of the fifteenth century. Its architecture makes it one of the most striking buildings in Europe. On the south and west sides the basement is surrounded by a colonnade of 36 columns, surmounted in the second story by a colonnade of 71 smaller columns. The upper stories form a heavy square mass, relieved by polychrome decoration of various marbles, balconies, pointed arches, and circles, with a battlemented cornice. The Porta della Carta, so called from the placards on which the laws of the Republic were published, the Court, and the Giants' Staircase, at the head of which the doges were crowned, are among the most perfect extant works of the Renaissance. On the east, the palace is connected by the famous Bridge of Sighs with the old prisons. The building is rich in historical memories. It contains the magnificent Sala del Maggior Consiglio, or Great Council Hall, in which the meetings of the Nobili were held; and the Sala dello Scrutinio, or Voting Hall, both surrounded with historical paintings; the Library of Saint Mark, with rare manuscripts and miniatures; the Archæological Museum; the famous Bocca di Leone, an orifice opening into the anteroom of the Inquisitors, and used to deposit secret information and accusations; torture chambers and dungeons, and the place of execution for political offenders.

DOG-FEN'NEL. See FEVERFEW; MAYWEED.

DOGFISH. A popular name for small sharks, apparently because they follow their prey like dogs hunting in packs; also "hound" and "bone-dog." It is most commonly given in the United States to *Squalus acanthias*, of the "spiny dogfish" family Squalidæ, of which characteristic features are a spine before each of the two dorsal fins; spiracles or spout-holes; five gill-openings on each side all before the pectoral fins; no anal fin and no nictitating membrane of the eye. It is oviparous. The body is long and tapering; the head flat; the snout conical, the teeth in both jaws sharp-edged and formed for cutting. It attains a length of 3 to 4 feet and a weight of 10 to 15 pounds. It is abundant on both coasts of the North Atlantic. The dogfish of the Pacific Coast of North America is taken in great numbers for the sake of the oil extracted from its liver. (See Plate of LAMPREYS AND DOGFISH.) The same name is given to the "requiem sharks" (Galeidæ), especially to the smooth hound or "dog-shark" (*Mustelus canis*) of the North Atlantic (see TOPE), which resemble the Squalidæ in general form, but have an anal fin and are ovoviviparous; also to the bow-fin (q.v.).

DOG'GERBANK (Engl., Ger., Dutch *dogger*, sort of Dutch fishing-boat + *bank*). An extensive flat sandbank near the middle of the North Sea between England on the west and Denmark on the east, with a maximum breadth of 60 miles and an average breadth of about 40 miles. It stretches northeast and southwest for a distance of about 200 miles between the limits of latitudes 54° 10′ N. and 55° 40′ N. and longitudes 1½° E. and 5° E. It has in general a depth of less than 120 feet, and toward the English coast has little over 50 feet of water. This bank furnishes important cod-fishing grounds. On the night of October 21, 1904, the Russian Baltic squadron, under Admiral Rozhestvensky, on its way through the North Sea to the Far East fired upon a British fishing fleet on the Dogger, killing two men. The incident was finally settled by arbitration, Russia paying damages for loss sustained. The action of the Czar's fleet was due probably to sudden panic.

DOG'GETT, or **DOGGET**, THOMAS (?-1721). An English comedian and manager. He was born in Dublin. He appeared in 1691 in London at Drury Lane, as Nincompoop in *Love for Money*. In 1695 he first played the part of Ben in Congreve's *Love for Love* with Betterton at Little Lincoln's Inn Fields. The next year he played Hob in his own piece called *The Country Wake*. In 1701 he played Shylock, as a comic part, to Betterton's Bassanio. He became, in 1709, one of the managers of the Haymarket, but left his partners about four years afterwards, and later played a few times at Drury Lane. The well-known prize which bears his name, Doggett's Coat and Badge, was founded in 1716 in celebration of the accession of George I. Consult Doran, *Annals of the Stage*, edited by Lowe (London, 1888).

DOG GRASS. See COUCH-GRASS.

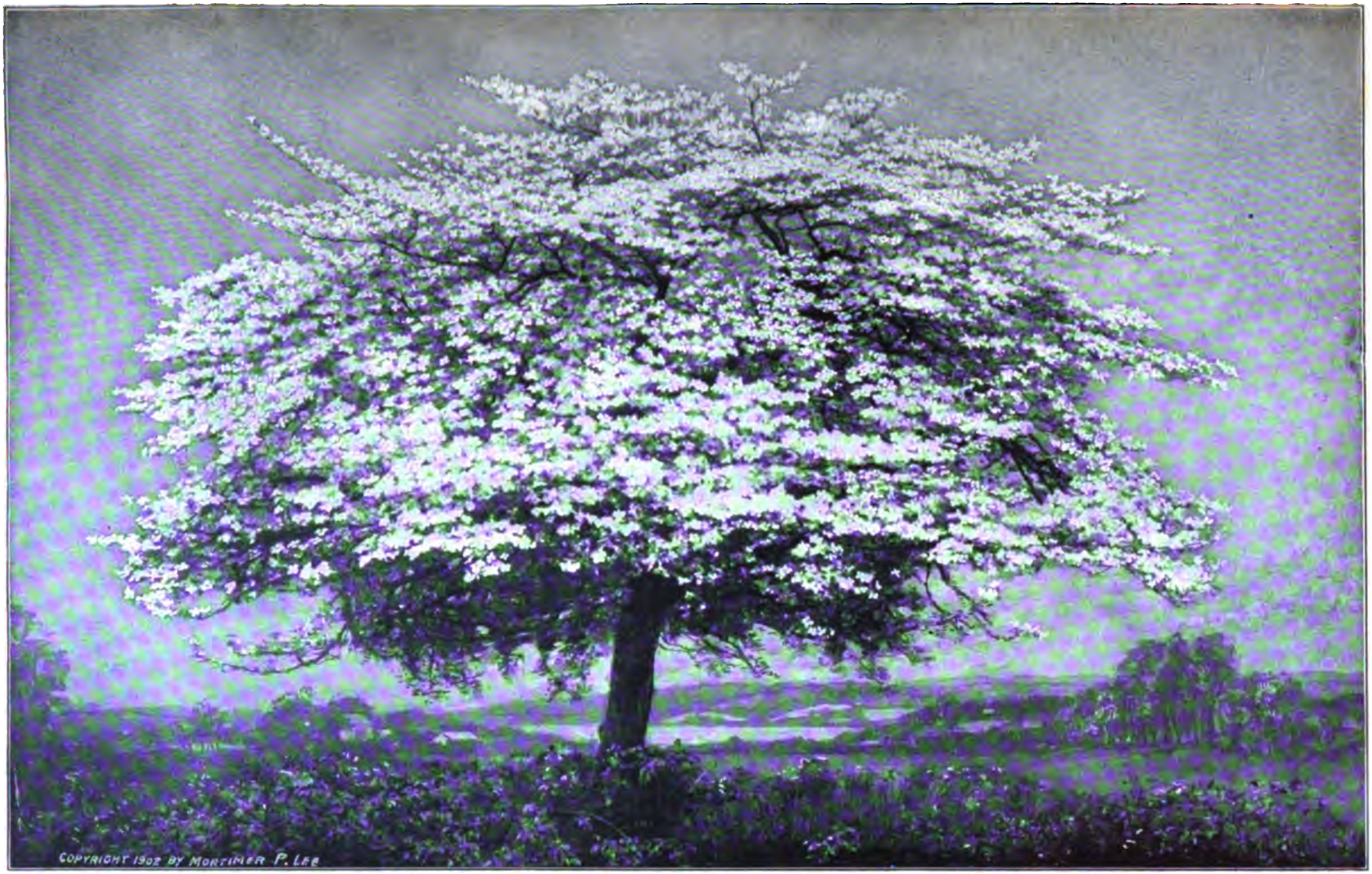
DOGMA (Lat., from Gk. δόγμα, *dogma*, from δοκεῖν, *dokein*, to seem). Originally an opinion or proposition, put as a positive assertion, its truth being supposed to have been previously shown. In theology, it was understood to signify a doctrine defined by the Church, and advanced not for discussion, but for belief. But as this method of stating truth easily degenerates into the assertion of opinions without ground, and without regard to the aspect they may present to others, *dogma* and *dogmatism* have come in English to be almost synonymous with assertion without proof.

In Continental theology, however, the word is still used without implying any censure, dogmas (Ger. *Dogmen*) meaning simply doctrines; and this is the case in our own expression, dogmatic theology or dogmatics, which is that branch of theology that treats of the systematic arrangement of the doctrines of Christianity. The first attempt to give a connected view of Christian doctrine was made in the fourth century by Augustine, who in his *Encheiridion* and other works treated of the whole body of doctrine held by the Church, though without any very scientific arrangement. The contributions to dogmatics made in the fifth, sixth, and seventh centuries were mere collections of 'sentences.' In the East, in the eighth century, the doctrines of the Greek Church were treated by John of Damascus in a form already Aristotelian, and his work may be considered the first systematically arranged treatise on dogmatics. His book was as influential in the Greek Church as the writings of Augustine in the Latin. The regular systematizing of doctrines began with the Scholastics in the eleventh century, but degenerated often into hair-splitting. The first cultivators of dogmatic theology among the Scholastics were Hildebert of Tours (died 1133) and Abélard (died 1142), who were followed by Petrus Lombardus (died 1164), Alexander of Hales (died 1245), Thomas Aquinas (died 1274), Duns Scotus (died 1308), etc.

The era of the Reformation revived dogmatic controversy, leading it back from Aristotle to biblical theology. But the controversies between the different churches in the seventeenth century and the too great importance attached to confessions of faith, cramped anew its freedom, and gave it again a Scholastic turn. (For the history of these controversies and for the later development of Protestant dogmatics, which, under the influence of German criticism and philosophy, have assumed a less and less positive form, see REFORMATION; GERMAN THEOLOGY.) Under the stimulus of opposition from without, the theologians of the Roman Catholic Church have devoted much labor in modern times to the production of systematic treatises, which usually adhere to the old logical methods of the schoolmen, while taking account of all modern objections to what they consider revealed dogmas. The names of Canisius, Petavius, Thomassin, Bellarmine, Suarez, Liebermann, and Perrone may be mentioned among a host of others in the last three centuries. Pope Leo XIII. has consistently held up Saint Thomas Aquinas as the norm of modern dogmatic theology, and has caused an increased study and use of his works. As a result of the Tractarian movement, much more attention than formerly has been paid to dogmatic theology in the Church of England and its allied bodies, but few complete or systematic works have been produced, and many of the more modern are derived from the Roman Catholic authorities named above. For the history of dogmas, see DEVELOPMENT OF DOCTRINE; CREEDS AND CONFESSIONS.

DOGMATISM. In philosophy, the assumption of metaphysical knowledge without examining the conditions and the limits of the possibility of knowledge. It is the willingness to accept the deliverances of consciousness without any further ado. All naïve consciousness is in a certain sense dogmatic. The infant apparently does not question the reality of his experiences. But in time the inconsistencies into which he gets by accepting without question everything that comes

DOGWOOD TREE

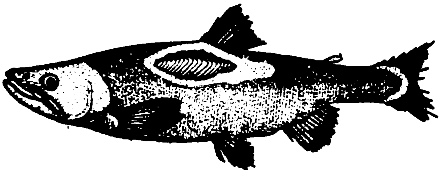


DOGWOOD TREE (Cornus florida); Southern New York, early May.

to him as knowledge call attention to the fact that all is not knowledge that seems to be. If, in spite of this fact, a theorist still accepts any judgment as valid in respect to ultimate reality, without first inquiring whether his general conception of knowledge is tenable, and whether a tenable conception validates those judgments, he is a philosophical dogmatist. Philosophical dogmatism may then be defined as the attempt to philosophize without basing one's philosophy on a scientific epistemology. See KNOWLEDGE, THEORY OF; CRITICAL PHILOSOPHY; EMPIRICISM.

DOG OF MONTARGIS, mōɴ'tär'zhē'. See AUBRY DE MONTDIDIER.

DOG SALMON, săm'ŭn. (1) A salmon (*Oncorhynchus keta*) of the northwestern American coast, which resembles the quinnat, but is much smaller and without spots on the fins. It ascends all streams from San Francisco to Kamchatka, but its flesh is of little value. Native names are hay-ko, le kai, and keta. (2) In Alaska, an allied species, *Oncorhynchus gorbuscha*. (See SALMON.) (3) The adult male of any salmon, when it is ascending a river in the breeding season, or attending upon the females at the spawning-grounds. In the course of this duty constant fighting occurs, and the survivors return to the sea in a very damaged condition.



A DOG SALMON.

Mutilated male of the blueback (*Oncorhynchus nerka*) returning to the sea at the close of the breeding season.

DOG SHARK. See DOGFISH and TOPE.

DOG'S MERCURY. See MERCURY, DOG'S.

DOG'S-TAIL GRASS (so called because its spike is fringed only on one side), *Cynosurus*. A genus of grasses having a close spike, each spikelet with two equal glumes and three to five florets, and beneath each spikelet a comb-like bract or involucre. The species, which are not very numerous, are chiefly natives of Europe and Asia; but one only is common and valuable, the crested dog's-tail grass (*Cynosurus cristatus*), which forms an important part of almost all good pastures, and is particularly esteemed for sheep pastures and lawns, for the improvement of which it is often sown. It is a perennial grass, growing in tufts one or two feet high, with many fine root-leaves. Its herbage is fine and close, and its deep roots secure it against droughts, which cause many other grasses to wither; but the herbage is not sufficient in quantity to make it desirable for hay. The seeds are small, shining and yellow, whence the name goldseed sometimes given to this grass by farmers. The mature stems of this grass are used in the manufacture of Leghorn hats. It has been sparingly introduced into the United States. It grows best on rich moist soil, and, as it endures shade well, is adapted to shaded lawns.

DOG-STAR. See SIRIUS.

DOGUE'RA. A baboon (*Cynocephalus doguera*) of Abyssinia, more olive in color than the sacred baboon (see BABOON), but possibly a variety of it.

DOG'S-TOOTH VIOLET. See ERYTHRONIUM.

DOG WATCH. The two short watches of two hours each, from 4 to 6 P. M., and 6 to 8 P. M. These watches were introduced for the purpose of securing a change of watch each day for the watch officers. As it makes seven watches per day instead of six, it causes officers to have different watches every day, if there are less than seven—and the number rarely exceeds five—except for a few days at a time, and this exceptionally. See WATCH.

DOG-WHELK. See WHELK.

DOGWOOD. A name given to some of the shrubby and arborescent species of the genus Cornus. There are about twenty-five species indigenous to Europe, Asia, and North America, most of which are shrubs, although a few become trees. The common dogwood (*Cornus sanguinea*) of Europe is a shrub 12 to 18 feet high. As with all the larger shrubs and trees of the genus, the wood is hard and the bark bitter. The fruit is small and in France an oil used in soap-making is expressed from it. The Cornelian cherry (*Cornus mas*), also a native of Europe, yields an edible fruit, which is sometimes used for preserves. Cornus kousa and Cornus capitata are trees in the eastern part of Asia, and Cornus florida, Cornus alternifolia, and Cornus Nuttallii in the United States. The last-named species is the largest of the genus, trees often reaching a height of 70 to 90 feet and a diameter of two feet. It is confined to the Pacific Coast region from British Columbia southward. The common species in the United States is Cornus florida, which is found from Massachusetts to Texas. It is a small tree rarely more than 30 feet tall, and is well known on account of its four, sometimes more, white or pink showy bracts ('flowers'), which surround the inconspicuous greenish-yellow true flowers. In Cornus Nuttallii the bracts are a deep pink and are four or five inches across, making the tree a very striking object in the forest. The berries are red and remain on the trees during most of the winter. The wood is white, hard, and fine-grained, and is much used for inlaying, turning, etc. The bark of Cornus florida contains a bitter tonic principle somewhat resembling that found in cinchona, like which it is used to some extent in the treatment of fevers. Other species also contain it, but in smaller quantities. Two dwarf herbaceous species are common at high latitudes, Cornus Canadensis and Cornus suecica. They are but a few inches high, have small, white-bracted clusters of flowers and red berries, often called 'bunch-berries,' from their habit of growth. The shrubby species are common along watercourses and do not have bracts to their flowers. Some of them are quite showy when in flower, and also in winter, when their stems are bright red. The autumn coloring of all the species is very striking, red colors prevailing. In the West Indies, Piscidia erythrina, a leguminous tree, is known as dogwood. Its timber is hard and very durable. The bark contains a narcotic substance frequently used for stupefying fish, and as an anodyne in medicine. Poison dogwood, or poison sumac, as it is more properly called, is Rhus venenata, a species nearly related to and greatly resembling the Rhus vernix of Japan, one of the trees from which, through the action of the lac-insect (*Casteria lacca*), the lac of commerce is derived. Poison sumac can be distinguished from the non-poisonous species of sumac by its spreading flower-clusters and white berries. The flower-clusters of harmless species are very compact and the berries red. See CORNEL.

DOHERTY, dōh'ĕr-tĭ, ROBERT REMINGTON (1848—). An American theologian and author. He was educated at Dickinson College, Pa., and at Grant University, Tenn. He is widely known as a writer on religious and other topics. His principal works include: *A Guide to the Study of the International Lessons*, an annual publication (jointly with Dr. J. L. Hurlbut and Dr. T. B. Neely, 1891-1901); and *Representative Methodists* (1888).

DOHM, dōm, ERNST (1819-83). A German humorist. He was born at Breslau, and studied theology and philosophy at Berlin and Halle. He was editor of *Kladderadatsch*, one of the leading humorous publications of Germany, from 1849 until his death, and took high rank as a master of political satire. He translated the *Fables* of Lafontaine into German (illustrated by Gustave Doré, 1876-77) and published several comedies and farces, of which *Das erste Debut* (3d ed. 1860) was probably the most popular.

DOHNANYI, dŏ'nŏn-yė, ERNST VON (1877—). An Hungarian pianist and composer, born in Pressburg. He studied at the Royal Conservatory in Budapest (1894-97), where several of his compositions received prizes. For two months during the summer of 1897, he studied with D'Albert, and in the autumn of the same year began a successful concert tour of the principal cities of Austria-Hungary, Germany, and England. Beginning in March, 1900, he made a successful concert tour in America, and returned in October, 1900, for another tour. He played, with the Boston Symphony Orchestra, his pianoforte Concerto in C minor (Rosendorf prize composition, Vienna, March, 1899), and composed, besides that work, piano pieces, chamber music, a 'cello sonata, and two symphonies, which show a decided talent for the larger forms.

DOHRN, dōrn, ANTON (1840—). A German zoölogist, son of Karl August Dohrn, born in Stettin. He studied the natural sciences under Haeckel in Jena, where he subsequently became privat-docent. He was also for several years interested in the investigation of marine animals, especially crustaceans, and made excursions to the coast of England and to the Mediterranean for the purpose of studying them. In 1870 he founded the Zoölogical Station at Naples, the first and most important institution of its kind. (See ZOÖLOGICAL STATION.) He has written *Der Ursprung der Wirbelthiere* (1875); *Studien zur Urgeschichte des Wirbelthierkörpers* (1882).

DOHRN, KARL AUGUST (1806-92). A German entomologist. He was born in Stettin, educated in Berlin, and traveled extensively. In 1843 he became president of the Entomological Society of Stettin (the first to be established in Germany), and editor of the *Entomologische Zeitung*. From 1846-66 he was engaged in the publication of the *Linnæa Entomologia*, a work of sixteen volumes. He was one of the most distinguished coleopterists of his time.

DOK'ANA (Gk. *δόκανα*, from *δοκός*, *dokos*, beam). A rude Spartan symbol formed by two upright beams crossed by other beams. It was of very ancient origin, and was probably the image of the Dioscuri, which the Spartan generals took with them in the field.

DOKO, dō'kō. A term applied generally to dwarfish tribes of central Africa; pygmy. Consult Keane, *Man, Past and Present* (Cambridge, 1899).

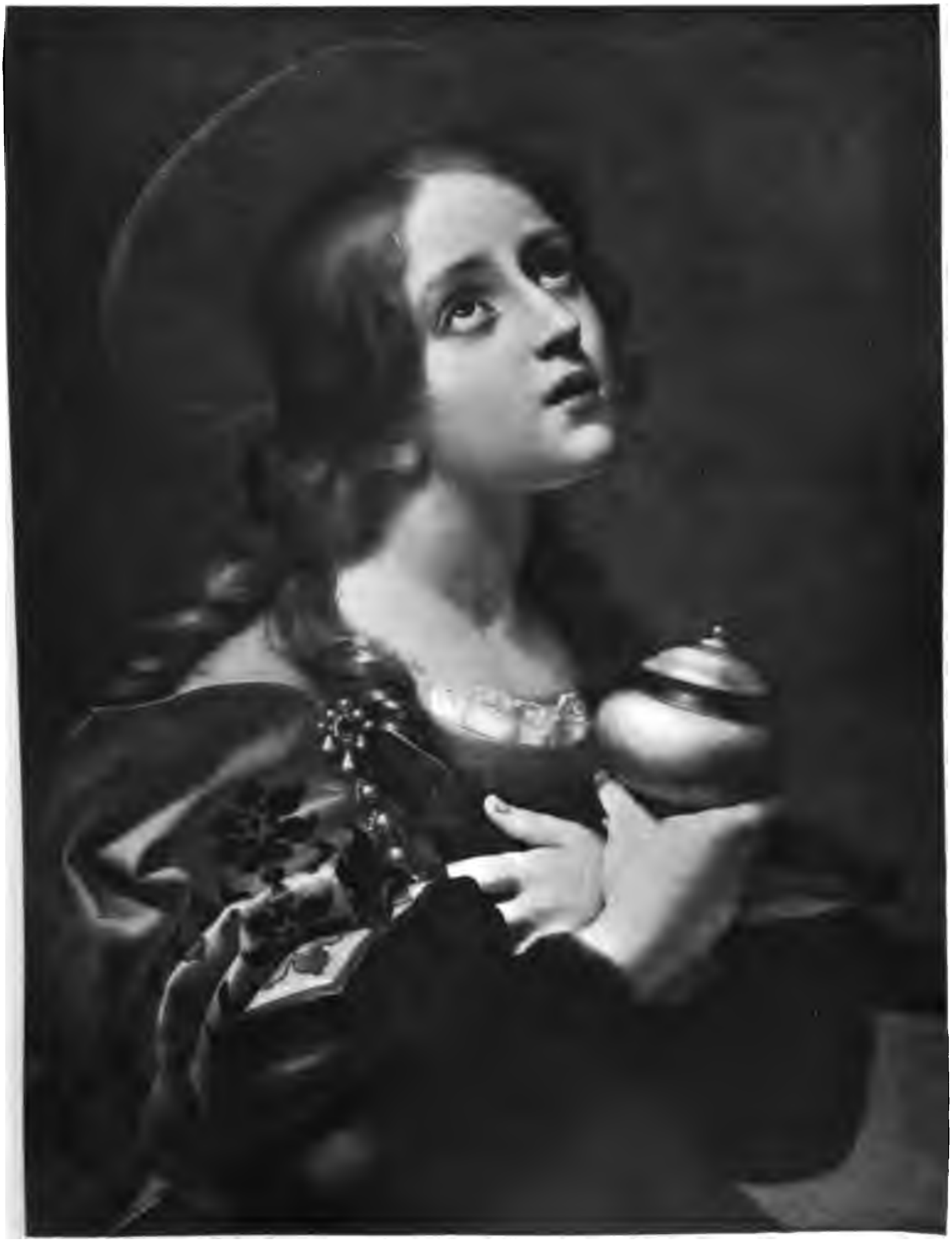
DOL'ABEL'LA, PUBLIUS CORNELIUS (c.70-43 B.C.). A Roman of patrician family, and of profligate character. Though involved in criminal charges, he was defended and protected by Cicero; and in B.C. 49 he put away his wife Fabia that he might sue for the hand of Cicero's daughter Tullia, whom he married, notwithstanding the orator's opposition. The recklessness of Dolabella plunged him always deeper into debt, until in a short time, driven from Rome by the demands of his creditors, he took refuge in Cæsar's camp, and was assigned to the command of a fleet. He took part, but without distinction, in the battle of Pharsalia, and then returned to Rome, hoping to be enriched from the spoils of Cæsar's victories, but in this he was disappointed. Accordingly he had himself adopted into a plebeian family and secured the tribuneship, when he audaciously proposed a law that all debts should be legally cancelled, and this led to long and bloody contests. Cæsar gave him appointments in his African and Spanish campaigns. On the death of the Dictator, B.C. 44, Dolabella seized the consular insignia and allied himself with the conspirators. He was, however, soon won over by Antonius, who made him governor of Syria. He caused at Smyrna the death of the proconsul, C. Trebonius, who had withstood his schemings. At length Cassius advanced against him and besieged him in Laodicea, where, to avoid capture, he ordered a soldier to kill him (B.C. 43).

DOLA'BRA (Lat., from *dolare*, to hew). The Roman name for an implement used by soldiers in building palisades or tearing down walls, or as a battle-axe; by the husbandmen for breaking up the soil or trimming trees; and finally, as sacrifices. It seems to have had a long handle of wood, to which is attached a head having a hatchet-blade on one side, and a slightly bent pick on the other. See CELT.

DOLBEAR, AMOS EMERSON (1837—). An American inventor and teacher. He was born in Norwich, Conn., and graduated from the Ohio Wesleyan University in 1866. In 1874 he became professor of physics at Tufts College (Mass.). He made several important inventions and researches in connection with the writing telegraph (1864), the magneto telephone (1876), the static telephone (1879), wireless telegraphy (1881), and photographing with electric waves (1893). In 1873 he announced the convertibility of sound into electricity. His works include, *Matter, Ether, and Motion* (1892).

DOLCE, dōl'châ, LODOVICO (1508-68). An Italian author, born in Venice. He wrote or translated a number of works, few of which have escaped oblivion. He was by turn dramatist, poet, historian, compiler, and editor. His principal play, *Marianna*, is still acted.

DOLCI, dōl'chê, CARLO (1616-86). A Florentine painter, born May 25, 1616. At the age of



CARLO DOLCI
"THE MAGDALEN," FROM THE PAINTING IN THE UFFIZI GALLERY, FLORENCE

fourteen, he painted a portrait of himself, especially good in color, now in the Pitti Gallery. Although a pupil of Jacopo Vignali (q.v.), he did not follow the general tendency of the Mannerists, but finished his works very carefully, and confined himself chiefly to small pictures of a religious nature. His colors are not without harmony, but their effect is marred by heavy, dark shadows, and the surface of his pictures is almost as smooth as porcelain. His work is chiefly characterized by its religious sentimentality. Among his best paintings is his own portrait at the age of fifty-six, and that of the "Archduchess Claudia," both in the Uffizi at Florence; "Christ Blessing the Bread and Wine," and "Saint Cecilia," in the Dresden Gallery; and the famous "Magdalen" at Munich. His works may be best studied in the Uffizi and Pitti galleries, and in the Corsini Palace in Florence. His only picture painted life-size, the "Virgin Appearing to Saint Louis, Bishop of Toulouse" (Uffizi), shows his incapability of treating larger subjects. His works were often repeated by himself, and especially by his daughter and pupil Agnese, and have been frequently engraved. He died in Florence, January 17, 1686. Consult Baldinucci, *Notize de' professori del disegno* (Milan, 1812).

DOL'CINITES, or **DUL'CINISTS**. The followers of Dolcino. See APOSTOLIC BRETHREN.

DOL'DRUMS (apparently a quasi-Lat. form of dialectic Engl. *dold, dolt*, really p.p. of *dull*, to stupefy, from *dull*, AS., OS., *dol*, Ger. *toll*, stupid, mad). A name given by sailors to that part of the ocean near the equator in which calms and light baffling winds prevail with hot, sultry air, local squalls, thunder, and rain. In the doldrums sailing vessels beat about for weeks and they were formerly the dread of those vessels that had to cross the equator. The sailing directions and charts published by Maury were the first to give comprehensive directions for avoiding those parts of the ocean most troubled by the doldrums. The doldrums proper oscillate north and south of the equator with the season of the year. They lie farthest north in July, August, and September, and farther south in January, February, and March. In the Atlantic Ocean in February, the region having most characteristic doldrums extends between the equator and latitude 5° N. and between longitudes 50° and 30° W., whereas in August it extends between latitudes 5° and 10° N. and longitudes 30° and 45° W. In the Pacific Ocean, in January, the doldrum region extends, with but few interruptions, between the equator and latitude 15° S. and from longitude 130° E. eastward to longitude 145° W. In July it extends over two regions somewhat separated from each other, namely from latitude 10° N. to latitude 10° S., and from longitude 130° to 165° E., and again from longitude 145° to about 80° W., and from latitude 5° to 15° N. The region of the doldrums is characterized by the highest temperatures and moistures, coupled with the feeblest winds that occur anywhere on the ocean; the ocean surface in these regions is of a glassy smoothness, often bearing a thin layer of oil and waste left by passing vessels and floating for a long time on the surface. An irruption of cool air into the doldrums has been suggested as the initial step in the formation of a rainy region in which develop the West Indian hurricanes. Although there is but little horizontal motion of the air within the doldrums, yet there appears to be considerable vertical motion. The doldrum region lies between the region of northeast and southeast trade winds and is the apparent starting-point of the great upper currents that are supposed to flow from the equatorial regions north and south toward either pole.

DÔLE, dôl. The capital of an arrondissement in the Department of Jura, France, 25 miles southeast of Dijon (Map: France, M 4). It is picturesquely situated on a vine-clad slope rising from the right bank of the River Doubs, and the environs are tastefully laid out in gardens and promenades. The principal buildings are the Church of Notre Dame, a Gothic edifice of the sixteenth century; the Hôtel Dieu, the barracks, the Palais de Justice, occupying a conventual building of the fourteenth century, and the Tower of Vergy, which is now used as a prison. Its public institutions include a college, an agricultural society, a school of design, a picture gallery, and a public library. The chief manufactures of Dôle are hosiery, tiles, pottery, chemical products, and beer; there are also iron-smelting furnaces, flour-mills, and some trade in corn, wine, wood, marble, and iron. Population, in 1901, 14,627. Dôle was a Roman station and garrison town, and possesses the remains of a Roman bridge, aqueduct, and theatre. It belonged to the dukes of Burgundy and resisted with great spirit the efforts of Louis XI. to annex it. It became part of France in 1678.

DOLE, CHARLES FLETCHER (1845—). A Unitarian clergyman. He was born at Brewer, Maine, and was educated at Harvard and at Andover Theological Seminary. He became professor of Greek at the University of Vermont in 1873, and in 1876 was appointed minister of the First Congregational Church of Jamaica Plain, Boston. His publications include: *Early Hebrew Stories* (1886); *The Golden Rule in Business* (1895); *A Catechism of Liberal Faith* (1895); *The Coming People* (1897); *The Theology of Civilization* (1899); *The Religion of a Gentleman* (1900).

DOLE, NATHAN HASKELL (1852—). An American editor, translator, and author, born at Chelsea, Mass. He graduated at Harvard in 1874, and was for some time active as a writer and journalist in Philadelphia, New York, and Boston. He edited several publications, of which the most important are *The Rubaiyat of Omar Khayyam* (a variorum edition with Fitzgerald's fifth version as a basis; 2 vols., 1896, and frequently since); the *Collected Works* of Count Tolstoy (20 vols., 1899); *Flowers from the Persian Poets* (1901). His original works include *The Hawthorn Tree, and Other Poems* (1895); *A Life of Francis William Bird* (1897); *Omar, the Tent-Maker* (1899); *Peace and Progress* (1904), with B. M. Walker; *Latin Poets: An Anthology* (1905).

DOLE, SANFORD BALLARD (1844—). An Hawaiian statesman. He was born of American parentage, in Honolulu, Hawaii, graduated at Williams College, and was admitted to the bar in Boston. He was judge of the Supreme Court of Hawaii from 1887 to 1893. On the overthrow of the kingdom in 1893 he became President of the Provisional Government, and in 1894 was elected President of the newly established Hawaiian Republic, to hold office until 1901. President Cleveland's intention of restoring constitutional authority to Queen Liliuokalani was defeated by the action of President Dole. In 1898 he was appointed on the commission for recommending legislation regarding Hawaii to the Congress of the United States, and in 1900, after the annexation, he became Governor of the Territory of Hawaii, resigning in 1903 to accept an appointment as United States Judge of the Territory.

DOL'ERITE. See Basalt.

DOLES, Funeral. See Mortuary Customs.

DOLET, dô'lâ', Etienne (1509-46). A noted French scholar and printer, perhaps the illegitimate son of Francis I. He was born at Orléans, studied in Paris, Padua, and Venice, where he wrote Latin love songs. Returning to France in 1530, he studied law at Toulouse, but, becoming involved in controversy with the authorities, was imprisoned and finally banished. In 1535 he had a controversy with Erasmus, publishing *On the Imitation of Cicero* (Dialogus de Imitatione Ciceroniana), and in 1536 issued two folio *Commentaries on the Latin Language* (Commentatorium Linguæ Latinæ). He then secured from King Francis a general leave to print his own writings for ten years, and began vigorous work at Lyons endeavoring to placate the clergy by his *Christian Cato* (Cato Christianus), but irritating them as much perhaps by his Latin *New Testament* as by his French *Rabelais*. He was imprisoned for fifteen months, released on the pleading of Duchatel, the Bishop of Tulle, again arrested, freed by his own daring ingenuity, again arrested, taken to Paris, and on August 3, 1546, was branded, tortured, strangled, and burned as an atheist. It was said that he repented in his last moments, but there is no sufficient proof to substantiate this assertion. He was for some time looked upon as a Huguenot martyr, but there is no foundation for regarding him as a Huguenot at all, and Calvin accuses him of atheism. The minutes of Dolet's trial were printed by Tallandier in 1836 from the registers of the Parlement of Paris. Consult: Boulmier, *Etudes sur le XVIème siècle, Etienne Dolet* (Paris, 1875); Christie, *Etienne Dolet, the Martyr of the Renaissance* (London, 1899); and Firmin-Didot, *Essai sur la typographie* (Paris, 1852).

DOLGELLY, dŏl-gĕth'lê (Welsh, dale of hazels). A market town and the capital of Merionethshire, North Wales, on the Wnion, about 60 miles southwest of Chester (Map: Wales, C 4). It lies in a rich and picturesque valley, at the foot of Cader Idris, and during the summer months is much frequented by English and foreign tourists. It is celebrated as the place where Owen Glendower held his Parliament in 1404 and signed his treaty with Charles VI. of France. It has manufactures of coarse woolens and flannels. Population. in 1901, 2437.

DOLGORUKI, dôl'gô-rōō'kê, Peter Vladimirovitch (1807-68). A Russian author, born in Moscow. His *Notice sur les principales familles de la Russie* (published under the name of d'Almagro, 1843) caused his temporary banishment by Czar Nicholas I. Upon the appearance of his *La vérité sur la Russie* (1860), he was finally exiled from Russia for life. His *Mémoires* (1867-71) contain much of interest regarding many notable personages of his day.

DOLGORUKOVA, dôl'gô-rōō'kô-vȧ, Yekaterina Mikhailovna, Princess Yuryevskaya (1846—). The favorite of the Russian Czar, Alexander II., who contracted a morganatic marriage with her in July, 1880, after the death of his wife. She bore him a son, Prince Georgiy Yuryevskoy (1873), at present in the Russian Navy, and two daughters. After the assassination of the Czar she removed to Switzerland, and in 1882 published at Geneva, under the pen-name of Victor Laferté, *Alexandre II., Détails inédits sur sa vie intime et sa mort*.

DOLICHOCEPHALY, dŏl'ĭ-kô-sĕf'ȧ-lĭ. See Anthropometry; Man, Science of.

DOLICHOS, dŏl'ĭ-kŏs (Neo-Lat., from Gk. *δολιχός*, *dolichos*, long, on account of the long pods). A genus of plants of the order Leguminosæ, closely allied to Phaseolus (see Kidney-Bean), from which it is distinguished by the extension of the base of the standard so as to embrace the wings of the corolla at their base. The genus includes a considerable number of species, some shrubby, some annual, and some perennial herbaceous plants. Some have beautiful flowers, and some of the herbaceous species are cultivated on account of their seeds, which afford a kind of bean: or of their young pods, which, like those of the kidney-bean, are boiled for the table. The more important species are Dolichos lablab, a native of India and Egypt; Dolichos lubia, a native of Egypt; Dolichos sesquipedalis, a native of America; Dolichos soya or Soja hispida (the soy bean), and Dolichos biflora (horse gram), natives in India; Dolichos sphærospermus (calavana, or dark-eyed pea), a native of the West Indies. In the climate of Great Britain, even the most hardy kinds require the aid of a little artificial heat, and they are reckoned inferior to other kinds of beans or garden vegetables of easier cultivation. The well-known Chinese sauce or ketchup called Soy is made from the soy bean. Allied to Dolichos is the genus Canavalia, to which belong the sword beans of India. Canavalia ensiformis, the commonly cultivated species, has pods two feet long. Another allied genus is Psophocarpus. The seeds of Dolichos tetragonolobus are used in the Mauritius as beans are in America; and its pods and tuberous roots are common Indian esculents. Some species of Pachyrhizus, also an allied genus, are remarkable for their tuberous roots, as Pachyrhizus angulatus, a native of India, now cultivated in South America and other warm countries for its pleasant, turnip-like tubers; and Phaseolus trilobus, which has tubers two feet long and nearly cylindrical, much used as a boiled vegetable in China and Cochin-China. See Bean.

DO'LIUM (Lat., large jar). A genus of gastropod mollusks. See Tun-Shell.

DOLL (probably from *Doll*, abbreviation of *Dorothy*). A figure representing a baby, which has always been a favorite toy for girls. Dolls have been used from the earliest times and among all nations, barbarous as well as civilized, because such tastes and desires spring from that love of nursing and fondling infants implanted by nature in the female character. The manufacture of dolls is and has always been an industry carried on in the rural districts of Continental Europe, chiefly by the peasants in their homes. Factories for the manufacture of dolls have been introduced into England and America, but the extreme cheapness of peasant labor and the wonderful skill acquired by successive generations in the art of doll-making, still enable this handmade product to compete successfully with the output of the factory. As in the case of most other toys, dolls were at one time imported into Great Britain chiefly from the Netherlands; and hence not an unusual name for a doll was 'a Flanders baby.' These old Flemish or Dutch dolls were made of wood, with neatly formed faces and flashy dresses, the cheaper kinds having slender wooden legs. Most of the dolls made about 1860 were the long, slender, kid or cloth bodied dolls, with heads of papier-maché or china. Next came the beautiful wax dolls, with natural ringlets, eyes that open and shut, and apparatus inside by which they could be made to squeak and sometimes say 'Papa' and 'Mamma.'

These dolls, though very beautiful, were both expensive and perishable, and are no longer manufactured. Last of all came the wooden-bodied jointed dolls. These were invented by a Frenchman called Jumeau, and for a time were made wholly in France; but a jointed doll equally good, though less costly, is now made in Germany. China and bisque heads of dolls are made in little village factories in Continental Europe, the manufacture being limited by the village authorities on account of the smoke nuisance which it creates. Papier-maché and other composition heads are usually molded at home. In making dolls, the work is divided among the members of the household, the father molding the different parts of the doll, the mother painting them and making the wigs, while the children put the parts together. After completion, the dolls are taken to a general collecting house.

The manufacture of rubber dolls is a branch of the industry which is chiefly carried on in large factories. A recent development is the modern rag baby, a doll made from printed cloth and stuffed into the well-rounded form of a baby. This form of doll is printed in bright colors, and is largely made in America.

DOL′LALOL′LA. The Queen in Fielding's burlesque *Tom Thumb*. She has a trifling weakness as regards strong drink, and is a bit of a shrew. She is enamored of Tom Thumb.

DOLLAR. The unit of value in the monetary systems of the United States and Canada. The name itself is derived from Joachimsthal, in Bohemia, where the counts of Schlick, in the fifteenth century, struck large coins of silver from the metal found in the neighborhood. These were known as '*Joachimsthaler*,' or, by abbreviation, '*thaler*,' from which, through the Low German *daler*, the word *dollar* is derived.

Among the multitude of coins which prevailed before the nineteenth century, certain issues came to be regarded as standard by reason of the excellence of their manufacture, and became international coins of wide circulation. It was thus that a valley in the recesses of the Bohemian mountains gave the name to the monetary unit of Prussia before the establishment of the German Empire, and to that of the United States, Canada, Mexico, and other countries. Somewhat similar is the derivation of the term 'florin,' familiar in the Netherlands and Austria, and represented in the English coinage, from coins manufactured in the Middle Ages in Florence.

The American dollar, established by the Coinage Act of 1792, was taken from the Spanish dollar in circulation in the colonies, corresponding roughly to the average weight of the dollar, though it was slightly less than the legal weight. While the dollar, since 1792, has been the unit of value in the United States, it was, prior to 1873, but little represented by coins of this denomination. The silver dollar, by the act of 1792, weighed 416 grains, and had a fineness of .8924. This weight was changed by the act of January 18, 1837, to 412½ grains, .900 fine, at which it still remains. Under the act of 1873 *trade dollars*, weighing 420 grains each, of limited legal tender, were coined, in order to facilitate trade with China and Japan. Prior to 1873 only 8,031,238 dollars were coined. Large amounts of the half-dollars, which were then exactly half the size of the dollar, were, however, coined. Further coinage of the silver dollar was authorized by the acts of February 28, 1878, and July 14, 1890. Gold dollars, weighing 25.8 grains, with a fineness of .900, were authorized to be coined by the act of March 3, 1849, and over 19,000,000 were thus coined before the coinage was discontinued (September 26, 1890). By the act of March 14, 1900, the gold dollar was declared to be the standard of value in the United States, but no provision was made for the issue of a coin corresponding to the unit. See MONEY.

DOL′LARDEE′ (probably from *dollar*, on account of the color). A local name, in Kentucky, for the blue sunfish (*Lepomis pallidus*). See SUNFISH; and Plate of DARTERS AND SUNFISH.

DOLLAR-FISH (so called on account of the color and shape). A local name in Maine for the butterfish (*Stromateus triacanthus*).

DOLLART, dōl′ärt. A shallow, nearly landlocked inlet of the North Sea at the mouth of the river Ems, between the Prussian Province of Hanover and the Dutch Province of Groningen (Map: Netherlands, F 1). It is about 13 miles in length by 7 in breadth, and was formed by inundations of the sea, the first of which took place in the latter half of the thirteenth century and the last in the sixteenth century. By these watery inroads a large number of villages were submerged, and thousands of persons perished. Since then, part of the land has been reclaimed, especially on the Dutch shore.

DÖLLINGER, dĕl′lĭng-ẽr, JOHANN JOSEPH IGNAZ VON (1799-1890). A distinguished German Roman Catholic theologian and historian. He was born at Bamberg, Bavaria, February 28, 1799. He was educated there and at the University of Würzburg, where his father was professor of anatomy and physiology. He was ordained a priest in 1822. In 1823 he became a teacher at Aschaffenburg; in 1826, professor of Church history and ecclesiastical jurisprudence in the newly established University of Munich, and began an extraordinary career as historian, politician, publicist, disputant, and councilor. His first book, *Die Lehre von der Eucharistie in den ersten drei Jahrhunderten* (1826), was written at Aschaffenburg. In 1828 he published a history of the Reformation as the continuation of Hortig's *Handbuch der Kirchengeschichte*. In 1832 he was appointed *defensor matrimonii*. (See DEFENDER OF THE MARRIAGE TIE.) In 1833-35 he published a *Geschichte der christlichen*

Kirche, and in 1836-38 the *Lehrbuch der Kirchengeschichte*. Neither of these works was carried to completion; they are combined in the English translation, *A History of the Church* (1840-42). In his next work, *Die Reformation, ihre innere Entwicklung und ihre Wirkungen im Umfange des lutherischen Bekenntnisses* (1846-48), he gathered everything he could find unfavorable to the reformers and their work. *Luther, eine Skizze* (1851), also belongs to this period. For a time he undertook the duties of the chair of dogmatic theology and lectured on "The Philosophy of Religion," on "Symbolism," and on "Patristic Literature." He was a frequent contributor to the *Historisch-politische Blätter*, and published several pamphlets on subjects of occasional interest. He was one of the chief contributors to the first edition of Wetzer and Welte's *Kirchen-Lexicon*, in which his articles on Luther, on Bossuet, and on Duns Scotus attracted much attention. In 1845 he was chosen to represent the University of Munich in the Bavarian Chamber, but, being deprived of his professorship in 1847, he lost his seat. In the Parliament of Frankfort in 1848-49 he was recognized as the leader of the Roman Catholic party, and fought for the unconditional freedom and independence of the Church. In 1849 he was restored to his professorship and also to his place in the Bavarian Chamber, which he held till 1852. Up to this time Dr. Döllinger had been an ardent defender of Catholicity, and a bitter opponent of Protestantism. From now on, however, influenced by his historical studies, his attitude began to change, and tended more to liberalism. This change dates particularly from a visit to Rome in 1852. Works in which it is evident are: *Hippolytus und Kallistus, oder die römische Kirche in der ersten Hälfte des dritten Jahrhunderts* (1853); *Heidenthum und Judenthum, Vorhalle zur Geschichte des Christenthums* (1857; English translation, *The Gentile and the Jew in the Courts of the Temple of Christ*, 1862), a masterly survey of the condition of the world at the birth of Jesus; *Christenthum und Kirche in der Zeit der Grundlegung* (1860). In 1861 Dr. Döllinger delivered two addresses at Munich which were represented as hostile to the temporal sovereignty of the Pope, and brought upon him much criticism. To explain and justify his position he published *Kirche und Kirchen, Papstthum und Kirchenstaat* (1861), a comparative survey of the condition of the non-Catholic communions and of the Church, and also a résumé of the history and condition of the Papal States, holding that while the temporal sovereignty was the means providentially established for maintaining the spiritual independence of the Papacy, yet it was by no means essential, that the Papacy long existed without it, and that, even if it were overthrown, Providence would devise other means of attaining the same end. The second part was a criticism of the administration of the Papal States, which gave dissatisfaction to the authorities, as being, though well meant, inopportune, and therefore unfriendly. *Die Papstfabeln des Mittelalters* (1863), and an address delivered at Munich the same year, *Vergangenheit und Gegenwart der katholischen Theologie*, were no more acceptable. Similar feelings were aroused by the part taken by Dr. Döllinger in reference to the 'Catholic Union.' But his ability and learning were unquestioned, and his influence, especially at home, was very great until the approach of the time for opening the Vatican Council. It was understood that the doctrine of the infallibility of the Pope would be a subject of discussion and Dr. Döllinger was active in organizing opposition. Assisted by his colleague, Friedrich, and others, he wrote articles and letters on the subject for the Augsburg *Allgemeine Zeitung*, which were afterwards collected in book form: *Der Papst und das Konzil* (1869, under the pseudonym Janus), and *Briefe vom Konzil* (1870, under the name Quirinus). On the publication of the decree of the council defining the infallibility of the Pope in all doctrinal teachings on faith and morals addressed *ex cathedra* to the universal Church, Dr. Döllinger refused to accept the doctrine. In August, 1870, he presided over a gathering of theologians at Nuremberg which publicly repudiated the doctrine and formed the germ of the Old Catholic movement. In the organization of the Old Catholic Church, however, he took no active part. He was excommunicated by the Archbishop of Munich in April, 1871. While the sentence was pending, he was elected rector of the university of Munich by a large majority of votes, and after it was pronounced he received honorary degrees by the universities of Oxford and Edinburgh, and was decorated by the King of Bavaria and the Emperor of Germany. Although he ceased to teach theology, he continued to lecture on ecclesiastical history and related subjects. His literary activity was little diminished during this stormy period of his life. Among his later works may be mentioned: *Sammlung von Urkunden zur Geschichte des Konzils von Trient* (1876); *Akademische Vorträge* (1888-91); *Beiträge zur Sektengeschichte des Mittelalters* (1890); *Briefe und Erklärungen über die vatikanischen Dekrete* (1890); *Kleinere Schriften* (1890). With Professor Reusch he reprinted the autobiography of Bellarmine (1887), and prepared a history of recent Roman Catholic ethical discussion as a thrust at the Jesuits, *Geschichte der Moralstreitigkeiten in der römisch-katholischen Kirche seit dem XVI. Jahrhundert* (1890). He died at Munich, January 10, 1890. Consult: Kobell, *Ignaz von Döllinger, Erinnerungen* (Munich, 1891); Michael, *Ignaz von Döllinger, eine Charakteristik* (Innsbruck, 1893); and particularly the life by Friedrich (Munich, 1899-1901). See OLD CATHOLICS.

DOLLIVER ROMANCE, THE. A novel which Nathaniel Hawthorne engaged himself to contribute to the *Atlantic Monthly;* but which his last illness rendered him unable to complete. The first installment appeared in that magazine, July, 1864.

DOL'LOND, JOHN (1706-61). A distinguished English optician, inventor of the achromatic object-glass for telescopes. He was the son of a silk-weaver in humble circumstances who had come to London as a French refugee. Dollond followed his father's occupation, but was also able to devote himself to the study of mathematics, optics, and astronomy. In addition he made himself acquainted with anatomy and theology, and went so far in the study of the classical languages as to translate the Greek Testament into Latin, and was also able to read French, German, and Italian. He apprenticed his eldest son, Peter, to an optician; and after the latter had established himself in business on his own account, he was joined by his father in 1752. John Dollond now devoted himself to the improvement of the refracting telescope, in which work he was encouraged by the most distinguished scientific men of the time. After a series of well-contrived experiments and researches, commenced in 1757 and carried on for several years, he succeeded in constructing lenses where a concave lens of flint glass was combined with a convex lens of crown glass with the result that images were produced without any colored border. (See ACHROMATISM.) This was undoubtedly the greatest improvement that the telescope had received since its first invention. The memoir (published in the *Philosophical Transactions* for 1758) in which he gave an account of his investigations, was rewarded by the council of the Royal Society with the Copley medal. In 1761 Dollond was appointed optician to the King, and was elected a fellow of the Royal Society. His two sons continued to carry on the business with great success. Consult Kelly, *Life of John Dollond* (London, 1808).

DOLL'S HOUSE, A. The English version of *Et Dukkehjem*, a play by Henrik Ibsen (q.v.), produced in Christiania in 1879 and in London in 1889. The theme is the right of individualism in woman, which is set forth in the disillusioning experience of Nora Helmer, the young wife of a man fettered by conventional idealism.

DOLLY VARDEN. In Dickens's *Barnaby Rudge*, the coquettish daughter of Gabriel Varden, a locksmith, whom she rules completely. She is impulsive, soft-hearted, and full of pretty strategies. Her dainty dress of flowered dimity, cut short enough to show her neat ankles and buckled shoes, gave the name *Dolly Varden* to a style of dress which came into fashion soon after *Barnaby Rudge* was published.

DOLLY VARDEN TROUT (from the color, which resembles a *Dolly Varden*, a gown of gay muslin print worn by women about 1865-70). The common brook-trout (*Salvelinus malma*), a char of the mountains of western North America, "from the upper Sacramento to Montana, Alaska, and Kamchatka." It has a stout body, large head and mouth, and the back more elevated and less compressed than the Eastern brook-trout (*Salvelinus fontinalis*); the tail is almost truncate, and the adipose fin is unusually large. "General color, olivaceous; the sides with round red spots nearly the size of the eye, the back commonly with smaller pale ones, a feature of coloration which distinguishes this species at once from the others." It abounds in the streams of the northern Rocky Mountains, where it is also known as bull-trout or red-spotted trout; and in the far Northwest, where it has the Kamchatkan name 'malma;' it descends to the sea and sometimes reaches a weight of twelve pounds. It is one of the most beautiful and active of the Salmonidæ, and has been extensively transplanted to waters in the northeastern United States and Europe. See TROUT.

DOLMEN (Bret., table-stone, from *dol*, table + *men*, Welsh *maen*, stone; the Welsh equivalent is *cromlech*, bending slab). The name given to a class of monuments of prehistoric civilization, consisting of several great stone slabs, set edgewise in the earth and supporting a flat capstone for the roof, designed for a sepulchral chamber. The greatest historic interest attaches to these monuments, for several reasons. They were erected in the British Isles, in northwestern France, in Spain, along Northern Africa, in Syria, and chambered mounds exist as far east as Japan. They mark the Neolithic period in Europe, and their erection may be called the beginning of engineering. In Guernsey and elsewhere they are styled Druid altars, and are associated with Druidical rites. By some they have been attributed to the Celts, and this raises the question whether all the dolmen-builders of Northern Africa and Europe and even in Japan were of the same race. If they were, they would belong rather to the Iberic branch of Sergi's Eurafric species, a strain of whose blood may have reached the Orient. Dolmens were sometimes covered with immense tumuli, and again the earth envelope reached only the capstone. Some of the mounds were of great size, as that of Silbury Hill, Wiltshire, 170 feet high, and 316 feet along the slope. In some of the chambers might have been single interments; in others, says Keane, the same mound had to do duty for many generations, the original cell expanded into the 'family vault,' developing a system of lateral chambers 30 × 16, and 8 feet high, with roof slabs of corresponding size, some weighing 10, 20, and even 40 tons. Consult: Keane, *Ethnology* (Cambridge, 1896); Borlase, *The Dolmens of Ireland* (London, 1897).

DOLOMIEU, dô'lô'myẽ', DEODAT GUY SILVAIN TANCRÈDE GRATET DE (1750-1801). A French geologist and mineralogist. He was one of the Knights of Malta when a boy, and fought a duel with and killed a brother knight, for which he was condemned to death, but was saved in consideration of his youth. He then turned his attention to science, and visited Portugal, Spain, and Sicily, making interesting observations on the geological structure of the Pyrenees. He minutely described the earthquake in Calabria in 1783, and in later years studied the Alps, where he discovered the mineral 'dolomite,' which is named after him. He became professor in the Paris School of Mines and a member of the Institute from its formation. In 1798 he was on the scientific staff of Bonaparte's expedition to Egypt. Here he lost his health, and on the way home was left at Messina, where he was an object of political hatred because he had revealed in 1783 to the Grand Master of Malta the designs of the Neapolitans against that island. He was confined in a wretched dungeon, clothed in rags, and given only a bed of straw. There he was kept twenty-one months. Denied writing materials, he made a pen from a piece of wood, and with the smoke of his lamp for ink, wrote on the margins of his Bible his *Traité de philosophie minéralogique*, and *Mémoire sur l'espèce minérale*. At the conclusion of the treaty between France and Naples, he was released and took the chair of mineralogy at the Museum of Natural History in Paris. His collections of mineralogy included numerous and valuable specimens. Besides the works mentioned above, he wrote: *Voyage aux îles de Lipari* (1783); *Mémoire sur le tremblement de terre de la Calabria* (1783); *Mémoires sur les îles Ponces* (1788), etc. Lacépède's *Eloge historique* *de Dolomieu* is among the *Mémoires* of the Institute for 1806.

DOLNYA TUZLA, dôl′nyȧ tōōz′lȧ. The capital of a district of the same name and a garrison town in Bosnia, Austria-Hungary, picturesquely situated on the Julla, amid mountainous scenery, 38½ miles by rail southeast of Doboj. It has coal-mines, salt-works, a distillery, and an important trade in the products of an agricultural and stock-raising region. Its salt-mines have been worked since the Romans. Population, in 1895, 11,034.

DOL′OMITE (named in honor of the French geologist *Dolomieu*), BITTER SPAR, or MAGNESIAN LIMESTONE. A calcium-magnesium carbonate that crystallizes in the hexagonal system. It is white to reddish or greenish-white and sometimes of darker shades, even reaching brown and black in some varieties, with a vitreous and sometimes pearly lustre. Dolomite, both as a mineral and as a rock, is found in various parts of Europe. In the United States it occurs at many localities in Vermont, Rhode Island, New Jersey, New York, and Missouri. It is found both crystallized and massive. The crystallized varieties include the *pearl spar,* which is so called from its lustre. The massive varieties are frequently colored; the variety containing iron is called *brown spar;* the varieties containing manganese and cobalt are reddish. The compact varieties are used as building-stones. The Houses of Parliament in London were built from a variety found at Bolsover Moor, and Saint Patrick's Cathedral, in New York City, is built from a variety found in Westchester County, N. Y. Calcined and slaked, dolomite yields a cement offering considerable resistance to the action of water. Calcined dolomite is used as a lining for Bessemer converters (see IRON AND STEEL), and the mineral when treated with sulphuric acid yields calcium and magnesium sulphates, and so is used in the manufacture of Epsom salts.

DOLOO′. The capital of Mandara (q.v.).

DOLORES, dṓ-lṓ′râs, GRITO DE (Sp., shout of Dolores). The historic acclamations which welcomed the hoisting of the rebel banner on September 16, 1810, in Dolores, a town in the Mexican Province of Guanajuato. They initiated the overthrow, in that country, of Spanish rule.

DOLORES. A town of the Argentine Republic, in the province of Buenos Ayres, 127 miles by rail from Buenos Ayres. Population, in 1903, 10,000.

DOLPH, dŏlf, JOHN H. (1835-1903). An American figure and animal painter, born at Fort Ann, N. Y. He studied in Antwerp and in Paris, and afterwards opened a studio in New York City. He is best known by his graceful, spirited pictures of cats and dogs.

DOLPH, JOSEPH NORTON (1835-97). An American politician. He was born at Dolphsburg, N. Y., and was educated at Genesee Wesleyan Seminary at Lima. In 1862 he emigrated to Oregon, crossing the plains as a member of Captain Crawford's "Oregon Escort," a volunteer company authorized by act of Congress to protect emigrants to the Pacific Coast. In 1863 he began the practice of law at Portland, Ore., in partnership with John H. Mitchell, afterwards United States Senator. In 1864 he was elected city attorney, and in 1865 was appointed by President Lincoln United States Attorney for the District of Oregon. He served in the Oregon State Senate from 1866 to 1876, and in 1883 was elected to the United States Senate, to which he was reelected in 1889. In the Senate he took a prominent part in legislation, being in his second term chairman of the Committee on Coast Defenses, and a member of the committees on Public Lands, Foreign Relations, and Commerce. He was one of the first Senators from the Far West actively to oppose the proposition for the free coinage of silver.

DOLPHIN (OF. *dalphin, daulphin,* Lat. *delphinus,* from Gk. δελφίς, *delphis,* dolphin). A cetacean of the family Delphinidæ, characterized by the moderate relative size of the head, differing in this from the cachalots, and also usually by having numerous simply conical or nearly conical teeth in both jaws, although some of the species lose those of the upper jaw at an early age. The blow-hole is single. The family Delphinidæ includes, along with the dolphins, blackfish, porpoises, grampuses, etc., many animals which on account of their larger size are commonly called 'whales,' as the beluga, etc. The names 'dolphin' and 'porpoise' are often used interchangeably, but the true dolphins have the snout prolonged into a rather slender beak, which is abruptly separated from the convex forehead, even by a marked furrow; both jaws are furnished with numerous equal teeth. The species are numerous, and none apparently has a very wide geographical range. They are voracious animals, and are said to prey not only on fishes, medusæ, cephalopods, etc., but even on the wounded and feeble of their own species. They live in herds, which often delight the voyager in the ocean solitude by their gambols. Gathering about a ship, they display their agility in a thousand graceful motions, now leaping with curved bodies many feet into the air, then darting through a wave with incredible velocity, leaving a slender wake of whitening foam under the water; now the thin back-fin only is exposed, cutting the surface like a knife; then the broad and muscular tail is elevated as the animal plunges perpendicularly into the depths.

The common dolphin (*Delphinus delphis*) is found in the Mediterranean and in the northern Atlantic Ocean. It is usually not more than 6 or 8 feet long, but individuals have been seen of 10 feet. The body tapers toward the tail, which is crescent-shaped, and about a foot in breadth. The beak is about 6 inches long, and the blow-hole crescent-shaped. The color is blackish on the back, grayish on the sides, and satiny white. The female dolphin brings forth a single young one at a time, which she suckles and nurses with great care. The flesh of the dolphin was formerly considered a delicacy, and sailors still regard the capture of one as a happy event, giving a beef-like alternative to their fare of salted meat.

From the form of its beak, the dolphin receives from the French the names of *bec d'oie* (goose-beak) and *oie de mer* (sea-goose). It was very differently regarded and designated by the ancient Greeks, to whom it was *hieros ichthys* (sacred fish), and was invested with many fabulous attributes, and was the subject of many mythological legends. It was supposed to be peculiarly friendly to men, perhaps because the dolphin emits a peculiar murmuring or suppressed lowing cry. It was sacred to Apollo, who was worshiped at Delphi with dolphins for his symbols. The figure of the dolphin, therefore, appears on many ancient coins and medals. It is said to have been borne on the shield of Ulysses; early appeared on the shield of some of the princes of France, and gave its name to one of the fairest of the French provinces, whence the heir apparent of the French throne came to be styled 'dauphin.' It is not easy to account for the high regard in which the dolphin was anciently held; nor is it altogether easy to explain the very general transference of its name in modern times to the coryphene (q.v.), a true fish, renowned for those changes of color in its dying moments which poets have delighted to celebrate. Similar attributes are popularly given in Brazil to a dolphin (*Sotalia Guianensis*), very abundant in the Bay of Rio Janeiro, which the natives assert will bring to shore the bodies of drowned persons. This genus (Sotalia) has Oriental and African species ascending rivers, one (of the Kamerun River) having the nostrils (blow-holes) prolonged into a snout-like process.

The European dolphin is rare on the coast of the United States, but three or four other species occur, one of them, at least, numerously. This is the bottle-nosed dolphin (*Tursiops tursio*), which is caught in considerable numbers on the New Jersey coast. Closely allied to this species is the 'black' dolphin (*Tursiops erebennus*), which is not quite so large, and is wholly black in color. The spotted dolphin (*Prodelphinus plagiodon*) is occasionally found on our coasts. It is dark slate-color above, and pale or white below, somewhat spotted with slate. See Blackfish.

DOLPHIN. A fish. See Coryphene.

DOMAIN. See Demesne.

DOMAS Y VALLE, dō'mȧs ē vä'lyȧ, José (c.1717-1803). A Spanish naval commander and colonial governor, born at Cartagena. He advanced rapidly, and within six years of his admission to the navy attained the rank of chief of squadron. He participated in many engagements in the Mediterranean, and was commander of the vessel *Asis* in the West Indies during the war with England (1778-80). For his brilliant action in conveying the treasure ships of the Crown from Vera Cruz to Havana, past the fleet of Admiral Rodney, he received 5,500,000 pesos from the King. After participating in the capture of Pensacola (1781) and later in the siege of Gibraltar, he served as Governor of Panama from 1786 to 1794, and then became Captain-General of Guatemala.

DOMAT, dō'mȧ', or **DAUMAT**, Jean (1625-96). A French jurist. He was associated with the recluses of Port-Royal and with Pascal, who bequeathed to him his private papers. His elaborate digest, entitled *Lois civiles dans leur ordre naturel* (1689-94), places him among the first jurisconsults of his century; though it was not until after 1726, when Blackstone commended the work, and it was translated into English, that it received any degree of attention outside of France.

DOMATIA, dô-mā'shĭ-ȧ (Neo-Lat. nom pl., from Gk. δωμάτιον, *dōmation*, little house, diminutive of δῶμα, *dōma*, house). Portions of plants which are modified so as to form chambers in which various organisms, especially fungi or small animals, may dwell. See Symbiosis.

DOMBASLE, dôɴ'bȧl', Christopher Joseph Alexandre Mathieu de (1777-1843). A French agriculturist. In 1822 he was appointed director of the agricultural institute at Roville. He invented the plow which bears his name. An important innovation introduced by him was the use of lime in clayey soils. He contributed greatly to the improvement of agriculture in France by his numerous admirable works upon that subject, such as *Essai sur l'analyse des eaux naturelles* (1810); *Théorie de la charrue* (1821); *Instruction sur la distillation des grains et des pommes de terre* (1829).

DOM'BEY AND SON. A novel by Charles Dickens, first published serially in 1846. It narrates the fortunes of a London merchant whose chief desire is to assure the continuance of the firm name through his son Paul. He is indifferent to the death of the boy's mother, but is crushed by the early death of his son. His second wife, Edith, elopes with his manager, James Carker, and he incurs financial losses. His daughter Florence, whom he hates for living while his son dies, marries, and afterwards wins his affection, and her children are the solace of Mr. Dombey's later years.

DOM-BOC, dōm'bôk (AS. book of dooms or sentences, Lat. *liber judicialis*), or Doom-Book. The code of laws compiled by King Alfred chiefly from the West Saxon collection of his own ancestor Ine, but comprising also small portions of the Mercian laws of Offa and of the Kentish collection of Ethelbert, with the supplements of his successors. "Ine's collection," says Dr. Pauli, "was the only one received entire into the codex, which was chiefly applicable to the condition of the West Saxons. A few articles were admitted here and there from the Kentish and Mercian laws, but research into this matter is not possible, as Offa's book is lost." Alfred made few, if any, original laws, but contented himself with restoring, renovating, and improving those which he found already in existence. The peculiarly Christian character of the King is strongly impressed on this code, which begins with an extract from the Bible: "The Lord spake all these words, saying, I am the Lord thy God." Then follow the Ten Commandments, the part of the Mosaic law relating to criminal offenses, and passages from the New Testament, including the Golden Rule. The code was ratified by the Witan, as Alfred expressly informs us. Consult: Pauli, *Alfred the Great*, from the German (London, 1852); Thorpe, *Ancient Laws and Institutes of England* (London, 1840).

DOMBROWSKI, dôm-brôv'skê, or **DABROWSKI**, Jan Henryk (1755-1818). A distinguished Polish general, born in Pierszowice, in the District of Cracow. He entered the service of the Elector of Saxony in 1770; but in 1792, on the first symptoms of the insurrection in Poland, proceeded to Warsaw. He took part in the Polish campaigns against Russia and Prussia, and exhibited remarkable military talents. In 1796 Dombrowski went to France, where he was commissioned by the Directory to form a Polish legion among his exiled countrymen. The legion signally distinguished itself in the Italian campaign. In the campaign of 1799-1800 Dombrowski gave proofs of remarkable courage. After the Peace of Amiens he became a general of division in the service of the Cisalpine Republic; and after the battle of Jena he was ordered by Napoleon (1806) to summon his countrymen to arms. His entrance into Warsaw at the head of the Polish divisions resembled a classical triumph. At Dirschau and Friedland he won fresh laurels. In the fatal Russian campaign of 1812 he commanded one of the three divisions of the Fifth Army Corps, and at the passage of the Beresina saved from destruction the relics of Poniatowski's corps. In 1813, at the head of his Poles, he took an honorable part in the battles of Teltow, Grossbeeren, Jüterbogk, and Leipzig. After the fall of Napoleon Dombrowski returned to Poland, and in 1815 was appointed by Alexander I. a general of cavalry and a Polish Senator; but in the following year he withdrew from public employment to his estate in Posen. He died June 6, 1818. Consult: Chodzko, *Histoire des légions polonaises en Italie sous le commandement du général Dombrowski* (Paris, 1829).

DOMBROWSKI, Jaroslaw (1835-71). A Polish Socialist agitator and revolutionist. He was born at Czitomir, Volhynia, and entered the academy of the general staff at Saint Petersburg in 1848. Owing to his complicity in the insurrection at Warsaw, he was in 1864 condemned by the Russian Government to fifteen years' imprisonment at hard labor, and transported to Siberia. Before arriving at his destination, however, he escaped and fled to Paris (1865). Upon the outbreak of the War of the Commune, March 18, 1871, he was appointed commander-in-chief of the Communist forces stationed at Asnières by the Central Committee of the National Guard. In the following month he succeeded to the chief command of the entire Revolutionary forces; but after fighting at Neuilly and Montmartre, was killed by the Government troops while defending the barricade at the Boulevard Ornano.

DOMDAN'IEL. An immense submarine cavern near Tunis; a seminary for the black arts, introduced in the continuation of the *Arabian Tales*. Southey narrates its final destruction in *Thalaba*.

DOME (OF. *dome*, Fr. *dôme*, from Lat. *domus*, Gk. *δόμος*, OChurch Slav. *domŭ*, Skt. *dama*, house; connected ultimately with OHG. *zimbar*, Ger. *Zimmer*, Icel. *timbr*, AS., Engl. *timber;* the word is also influenced by Lat. *doma*, Gk. *δῶμα*, house). A term in architecture bearing a twofold meaning. It is loosely used, after the fashion of the German *Dom* and Italian *Duomo*, to designate a cathedral or some other building of importance, but its only genuine English scientific meaning is that of a spherical or polygonal covering of a building. Strictly speaking, it designates only the outer structure or surface of such a covering, the inner structure or surface being a *cupola* (q.v.); but in general usage dome means the entire covering. It may be of any material—wood, stone, metal, earthenware, etc. It may be built of a single mass, like the Pantheon, or a double or even triple series of concentric coverings, like Saint Peter's in Rome or Saint Mark's in Venice. Where there are several such connected surfaces, the outer does not necessarily follow the outline of the inner one. In fact, in many such cases as Saint Mark, and even more so in the Russian churches with their outer bulbs, there is very little resemblance of outline. Some domes curve directly from their base; others are raised on a special conical base called a *drum*.

Historically the dome falls into two great divisions—the period before and after the invention of the dome on pendentives; or, roughly speaking, the period before and after Saint Sophia in Constantinople. It was an early form, though not as early as the tunnel vault. It was known to the Assyrians and Persians (we do not yet know of its use by Egyptians or Babylonians), who used it over houses and palaces, sometimes with low, semicircular outline, sometimes with high ovoidal or pointed outline. These domes were made usually of brick and rested on solid walls. Where these walls were square, the transition was effected by bracket-like projections at the base of the dome. The Pelasgic and Mycenæan tribes also used the dome, but they built it of stone, and its supporting walls were always circular. The dome itself was often merely a false dome built up of overlapping horizontal stone courses, with their overlap subsequently chamfered off. Such was the Tholos of Atreus at Mycenæ. The early Italian tribes, as well as those of Greece, used this kind of dome, which appears in Etruria and Latium (e.g. Vetulonia), where there even appear signs of the Oriental form. The Romans, however, appear to have been the first to give really monumental expression to the dome. With them it was a bell-like mass of concrete casting resting solidly upon its circular base, as at the Pantheon, built by Agrippa, which remains the largest masonry dome in the world, 142 feet in diameter. This dome was faced with brick, and its walls interpenetrated by interacting arches which served to hold the concrete filling until it hardened. Such domes were built on wooden centrings. Smaller examples are the Temple of Minerva Medica, in Rome, and some of the halls in the thermæ. This form was popular in the Christian period for mausoleums (Santa Costanza, Rome), and sometimes for churches (San Stefano Rotondo, Rome), but especially for baptisteries. In the sixth century, after tentative attempts at Bozra and Ezra in Syria, at San Vitale, Ravenna, San Lorenzo, Milan, and Saint Sergius and Bacchus in Constantinople, the problem of suspending the dome on pendentives connected with piers, instead of on solid walls, was solved in the Church of Saint Sophia, Constantinople. In this way not only could the dome be used over any kind of ground plan, but several domes could be grouped above the same interior. This was an invention, therefore, of Byzantine architecture. The *pendentives* (q.v.) were curved triangular spaces bounded by arcs of circles connecting four square planes intersecting the circle at the base of the dome. The arches in these square planes were themselves supported on piers. Such domes were built up of independent material, not cast in concrete, and the units were usually hollow conical tile made of specially light earth, to lessen the weight. The skill shown in Saint Sophia was never afterwards duplicated, other Byzantine domes being much smaller and usually arranged in groups. The lateral thrust of these domes was received on buttresses or on the vaults of galleries and aisles. The Byzantine dome was originally low, but as the Middle Ages progressed, its drum increased in height until it became almost tower-like in outline, as in the churches of Saloniki, in Greece, and in late examples in Constantinople. The Arabs copied the dome from both Persian and Byzantine models. That of the Mosque of Omar in Jerusalem is probably the earliest extant. They also used it especially for mausoleums, calling them by the term *kubba* (cupola). There are many of these in Cairo, where the mausoleum-mosques are surmounted by some of the finest Mohammedan domes extant, such as that of Kaït Bey. The outline of these domes is sometimes that of a reverse curve—a new form. The Mohammedans invented an elaborate system of corbeling as a substitute for the regular pendentive. Their most colossal domes are in India; those of the Jumma Musjid and the Tomb of Mahmud in Bijapur are among the largest in the world, and that of the Taj Mahal in Agra among the most beautiful. The Turks also reproduced the dome of Saint Sophia more monumentally than had been done by the Byzantines themselves (witness the mosques of Mohammed II. and Solyman). Meanwhile the Byzantine dome had been imitated in mediæval Europe; in Italy, in Venice (Saint Mark), Padua (San Antonio), Ancona (cathedral), Pisa (cathedral), Palermo, and in Calabria; in France, throughout Périgord and the neighboring region (Périgueux, Cahors, Sonillac, Solignac, Angoulême, etc.), with scattering examples elsewhere. The so-called Gothic dome is a ribbed construction, originating in France, derived by combining this Byzantine dome with the ribbed Gothic groin vault. The dome of the Renaissance was developed out of a mixture of mediæval and Roman elements. Its earliest masterpiece, that of the cathedral in Florence, was planned in the Gothic period on mediæval lines, but perfected by Arnolfo through his study of Roman architecture. The dome entered more generally henceforth into architecture than it had done before in the West. Its greatest examples are those of Saint Peter's in Rome, by Michelangelo, and of Saint Paul's in London, by Wren; though other fine examples are La Salute, in Venice, by Longhena; the Invalides, by Mansart, and the Panthéon, both in Paris. The dome of Saint Isaac's Cathedral in Saint Petersburg is a sham structure of cast iron, which is a material that has been used in modern times for the construction of several colossal domes, such as that of the Vienna Exhibition (360 feet). Domes built of separate units—stone, brick, or tile—require no centring such as was necessary in Roman domes, but could be built up by the simple superposition of concentric rings. It has been found that pointed domes are as much stronger than hemispherical as the pointed is stronger than the round arch. Early domes like the Pantheon received light merely through an unprotected opening in the apex; later this was protected by a lantern, and at Saint Sophia for the first time a row of windows was opened in the base. It was this development of a clearstory at the base that led to the heightening of the drum. The following are the inside diameters of some of the larger domes: Pantheon, 142 feet; cathedral, Florence, 138½ feet; Saint Peter's, Rome, 137½ feet; Tomb of Mahmud, Bijapur, 137 feet; Saint Sophia, Constantinople, 105 feet; San Carlo, Milan, 105 feet; Saint Paul's, London, 102 feet; the Capitol, Washington (constructed of iron), 96 feet; Invalides, Paris, 92 feet.

Consult: Choisy, *L'art de bâtir chez les Romains* (Paris, 1873); id., *L'art de bâtir chez les Byzantins* (Paris, 1883); Franz-Pascha, "Die Baukunst des Islam," in Durm, *Handbuch der Architektur* (Darmstadt, 1887); Isabelle, *Les édifices circulaires et les dômes* (Paris, 1855); also the various monographs on Saint Peter's, Saint Paul's, etc. See CUPOLA.

DOMENICHINO, dȯ-mȧ'nė-kē'nȯ (1581-1641). An Italian painter of the Bolognese School (q.v.), whose real name was Domenico Zampieri. He was born in Bologna, October 21, 1581, and studied chiefly under the Carracci. Among his schoolmates were Guido Reni and Francesco Albani; with the latter he formed a life-long friendship. Together they visited Parma, Modena, and Reggio, studying the works of Correggio and his school, and it was in response to Albani's urgent letters that Domenichino went to Rome in 1603.

In Rome he was well received by his countrymen, especially by his teacher, Annibale Carracci, whom he assisted in his frescoes in the Villa Farnese. On Annibale's recommendation, he and Guido were employed in decorating the Chapel of Sant' Andrea, in the Church of San Gregorio. In executing this commission a rivalry arose between the two painters. Both represented the "Martyrdom of Saint Andrew," but while Guido chose the moment where the saint, at sight of the cross, falls into an ecstasy, Domenichino painted the martyrdom itself, in all its gruesome details. This rivalry culminated in Domenichino's "Last Communion of Saint Jerome," painted in 1614 for the chief altar of the chapel, and now occupying a place of honor in the Vatican Collection opposite Raphael's "Transfiguration." It is a noble and well-balanced composition, full of action, and is unquestionably the best of his works. In connection with his stay in Rome, Domenichino decorated the villa of Cardinal Aldobrandini, in Frascati, with frescoes from the life of Apollo, and the Abbey of Grotta Ferrata with a fine series representing the life of Saint Nilus (1609), among which the "Meeting of the Saint with the Emperor Otho" is particularly good. He also decorated the Church of San Luigi dei Francesi in Rome with frescoes from the life of Saint Cecilia.

In 1617, wearied by the annoyances caused by the jealousy of the painters in Rome, he returned to Bologna, and in 1619 he was married. From this time the Raphaelesque type of women disappears from his pictures, and is replaced by one less impressive, indeed, but full of charm and more realistic—the image of his wife. His chief work of this period is the "Madonna of the Rosary," now in the gallery of Bologna. In 1621 he returned to Rome, and was named principal painter and architect of the Papal Palace.

The chief works of his second stay in Rome were the "Four Evangelists," on the pendentives of the cupola of Sant' Andrea della Valle—noble and impressive representations—and a charming mythological canvas, "Diana and Her Nymphs Bathing," in the Palazzo Borghese, Rome. In 1631 he went to Naples to decorate the Capella del Tesoro, in the cathedral, with frescoes representing the life of Saint Januarius; but he was so restricted by his instructions, and annoyed by the murderous threats of Neopolitan artists, that he was unable to produce his best work. He died suddenly in 1641. It is supposed that he was poisoned. He was a man of modest disposition, diligent and conscientious in his work, and capable of fine and high emotions.

Domenichino and Guido Reni were the most important of the pupils of the Carracci, and Domenichino was the most naturalistic of them all. His art is midway between that of the Carracci and Caravaggio. His works are uneven in color, and the dominating tone is a soft gray. He was fond of using landscapes as backgrounds, which were of high decorative value. His portraits belong to the best done by the Bolognese School, good examples being his own portrait and that of Cardinal Agucchi, in the Uffizi Gallery, in Florence. As an architect he did some creditable work, but as a sculptor he was less successful. Consult the authorities referred to under BOLOGNESE SCHOOL OF PAINTING.

DOMESDAY BOOK, or **DOOMSDAY BOOK**. A statistical account of the state of England in the latter part of the eleventh century, prepared by command of William the Conqueror in the year or years just preceding 1086. It is one of the oldest and most valuable of English historical records. The origin and significance of the name is a matter of dispute. The Anglo-Saxon *Domas* were laws or dooms, and the term *Dom-boc* occurs in the laws of King Æthelstan and in the ecclesiastical laws of King Edgar. In a specific sense, the Anglo-Saxon Gospels use the word *domesdæg* for 'judgment day.' The inference, therefore, is that, as applied to the famous record which became the embodiment of the King's will and the ultimate basis for the adjustment of all future land relations, the term contains the two ideas of supreme authority and of final judgment or doom. The book has been known by several other names. It is mentioned as the *Rotulus Wintonie*, or the "Winchester Roll"; *Scripturæ Thesauri Regis*, or "The Writings of the King's Treasury"; *Liber de Wintonia*, or the "Book of Winchester"; and *Liber Regis*, or "The King's Book." The book itself bears in its colophon or seal the simple title *Descriptio*.

An anonymous contemporary has told the story of the Domesday Book in simple and vigorous language, and a translation of this plain and faithful narrative will best describe the way in which the work was first set on foot: "In the year 1085. . . . at midwinter, the King (William the Conqueror) was at Gloucester with his Great Council, and there held his court five days; and afterwards the archbishop and clergy had a synod of three days. There were Maurice chosen bishop for London, and William for Norfolk, and Robert for Cheshire. They were all the King's clerks. After this the King had a great consultation and very deep speech with his council about this land—how it was peopled, or by what men. He then sent his men all over England, into every shire, and caused them to ascertain how many hundred hides of land it contained, and what lands the King had in it, what castles there were in the several counties, and how much revenue he ought to get yearly from each. He also caused them to write down how much land belonged to his archbishops, his bishops, his abbots, and his earls, and—that I may be brief—what property every inhabitant of England possessed in land or in cattle, and how much money this was worth. So very straitly did he cause the survey to be made that there was not a single hide nor a yardland of ground, nor—it is shameful to say what he thought no shame to do—was there an ox or a cow or a pig passed by that was not set down in the accounts, and then all these writings were brought to him." The survey was made by the King's commissioners, but they seem to have had the aid of the chief men of every shire. A sworn jury, composed of the sheriff, lords of manors, priests, heads of hundreds, bailiffs, and six village tenants, made the inquest. There has been preserved for us the "Inquest of the County of Cambridge," an original return of the survey of that county. From this the Domesday Book for Cambridgeshire was afterwards compiled by the royal secretaries. In making this transcription, many errors and omissions were made. The same fact is noted when the Domesday Book is compared with the Exeter Domesday, an original return for the five southwestern counties of England. The enumeration of the cattle and swine, which the chronicler thought so shameful, is recorded in the original return for these counties, but is omitted from the Domesday Book. The omission was doubtless intentional, because such data could have no permanent importance. The errors and omissions, however, indicate beyond doubt that the persons who collected the original information were not the compilers and writers of the Domesday Book.

The local jury made the inquest as to the name of the place, who held it in King Edward's time (1042-66), and who was the actual possessor. They ascertained the number of hides in the manor, and what portion was reserved in the lord's own hand. The villeins, cotters, and serfs, freemen and socmen were enumerated. A census was made of the wood, meadow, and pasture, together with the number of mills and fish-ponds. Of all this there was to be a threefold return or valuation—as the land was held in King Edward's days, as it had been given by King William, and as it stood at the time the survey was made—and the jurors were to say further whether the assessment could now be raised. On the basis of the divisions of the country given in *Domesday* the taxes were levied.

The value of *Domesday* as an historical document can best be understood from an enumeration of the subjects which it elucidates. Besides giving the names of all those who held land under King Edward, and of the fortunate Normans who supplanted them after the Conquest, the book treats of the ancient customs of the realm in great detail. It describes the duties of the cities and towns when the King visited them, sets forth all the titular distinctions of the period, ecclesiastic, official, and lay, and mentions the different trades and occupations of the time. There is a classified census of the people, together with an account of the condition of the country, town, and city population. The measures of land are amply recorded, as are also the territorial names, jurisdictions, franchises, tenures, and services. Lists of foreign tenants and lands held by foreign monasteries have been compiled from the names enumerated in the book. Castles, manors, and markets find mention, as well as the condition of the churches, with their endowments and tithes. The book contains information about the metals in use at the time, and also about the quarries of stone and the springs from which salt was obtained. Eight varieties of money are spoken of, and interesting facts are given about their use. Finally, we get occasional hints as to the legal procedure of the time, both civil and criminal. The mere statement which has been made of its contents is enough to show the immense value of the Domesday Book for all purposes of inquiry into the condition of England under the early Norman kings. "It will ever," says Dr. Lappenberg (*History of England Under the Anglo-Saxon Kings*, London, 1845), "be found an inexhaustible source of information respecting the Anglo-Saxon and Norman constitutions, particularly in regard to the rights and revenues of the kings and their vassals, the relations of cities and towns, statistical accounts of various kinds, families and landowners, together with innumerable matters highly interesting to inquiring posterity, though unnoticed by the chroniclers of those times, either as too well known or as worthless. An intimate acquaintance with *Domesday* should supply the basis of every historical account of England, particularly of its special history during the Middle Ages."

The Domesday Book first appeared in print in 1783, in two folios. Types were cast for the purpose, so as to represent the abbreviations and contractions of the original manuscript. The work was ten years in passing through the press. In 1816 two supplementary volumes were published. One contained an excellent general introduction by Sir Henry Ellis of the British Museum, with indexes of the names of places and of tenants-in-chief mentioned in the work. The other volume contained four other records of the same nature: (1) The *Exeter Domesday*, already mentioned; (2) the *Inquisitio Eliensis*, a record closely resembling the Exeter Domesday, containing the survey of the lands of the monastery of Ely, in the counties of Cambridge, Hertford, Essex, Norfolk, Suffolk, and Huntingdon; (3) the *Winton Domesday*, containing two surveys of the city of Winchester, one made between 1107 and 1128, and the other in 1148; and (4) the *Boldon Book*, a survey of the possessions of the see of Durham, made in 1183. This work is especially valuable in that it partially makes up a deficiency in the survey for Domesday Book, which did not extend to the counties of Durham, Northumberland, Westmoreland, and Cumberland, either, it would seem, because they had lately been laid waste by the Conqueror, or because his authority was not fully established in them. A new and better edition of the *Boldon Book* was issued in 1852 by the Surtees Society, which in 1857 printed *Bishop Hatfield's Survey*, another record of the possessions of the see of Durham, compiled between 1345 and 1381. In 1861 a facsimile copy of that part of Domesday Book which related to Cornwall was published by the Ordnance Survey as an example of what could be done by the process of engraving called photozincography. This experiment proving successful, the Government continued publishing the rest of the Domesday Book, county by county, in the same way.

In 1872 the Government ordered a general return of owners of land to be prepared by the Local Government Board. This new Domesday Book was published in 1874-76.

BIBLIOGRAPHY. The literature of the subject is extensive. The more valuable authorities are: Maitland, *Domesday and Beyond* (London, 1897); Freeman, *History of the Norman Conquest*, vol. v. (Oxford, 1876); Eyton, "Notes on Domesday," in *Transactions of the Shropshire Archæological Society* (Shrewsbury, 1877); Birch, "The Domesday Book," in the *Journal of the British Archæological Association*, vol. xii. (London, 1835); Léchaudé D'Anisy, *Recherches sur le Domesday* (Caen, 1842); Round, *Feudal England* (London, 1895); Birch, *Domesday Book, a Popular Account* (London, 1887, containing a good bibliography of the subject); Ballard, *The Domesday Boroughs* (Oxford, 1904).

DOMESTIC (Lat. *domesticus*, from *domus*, house) **ANIMALS.** Those species of animals which have been brought under control by man and adapted to his uses or pleasure.

SIGNIFICANCE AND EFFECTS OF DOMESTICATION. Domestication implies taming and accustoming to the presence of man, to a greater or less extent, and a change from the wild habit; but the mere taming of an individual does not constitute domestication. Cultivation through a series of generations is necessary to fix domestic traits; and this is usually accompanied by a system of selection and breeding to develop and render permanent the qualities which are especially desirable. Domestication also implies a certain amount of care of the species, protection from severe weather, from wild animals, and from one another, and the providing of food or of the conditions under which it may be obtained. Domestic animals are also trained to some extent, and are confined or kept within bounds, and, in general, their activities and lives are under control, as distinguished from the freedom and the self-dependence of the wild state.

The changes in food, environment, habits, function, and breeding bring about many modifications in the outward form, external appearance, temper, and general character of animals, which soon distinguish them from their progenitors. The hair or wool becomes of a softer texture, the color of the coat or feathers changes, and the general conformation of the animal is greatly altered. The changed habits of life, as well as the food and the daily work or exercise, tend to the development of some parts of the body more than others, the emphasis of some characteristics and the suppression or elimination of others. Thus the skull of hogs which have not been required to root for their food has become shorter and the snout much blunted, and the intestines of the improved breeds of hogs are much longer in proportion to the size of the animal than those of the wild or earlier domesticated forms. This undoubtedly means that the modern pig, which is highly fed to hasten its growth, can eat a larger quantity of food in a given time, and it may indicate that he can digest it more thoroughly than his ancestors.

It may be said, in general, that under domestication, animals mature earlier, become more fertile, often more prolific, and present a greater tendency to variation than in the wild state. There are exceptions in which these changes are not all apparent, and it should be noted that species differ greatly in the extent to which they respond to and are altered by domestication. Sometimes the changes induced in appearance and characteristics have been comparatively slight, as in the case of the camel, the elephant, and the ostrich; while in other cases they have amounted to the evolution of forms which in a wild state would be regarded as new species.

As a rule, the species which under domestication have proved most useful to man have possessed high fertility, giving numbers, and marked tendency to variation, giving opportunity for improvement and development in some particular direction by selection and breeding. These are prime requisites to rendering a species of great adaptability and usefulness; and the absence of them in some has restricted the scope of their usefulness. The camel, for instance, appears in its native state to have possessed qualities which suited it admirably to man's uses in a rather limited region; and, not exhibiting a marked tendency to vary, it has not been changed much by man, nor have any traits been artificially developed to a high degree. His range of usefulness will probably remain in its present bounds, and become more and more restricted as civilization advances in the regions where he now finds his greatest usefulness. Cattle, on the other hand, tend strongly toward variation, and breeds showing wide differences in size, tendency to beef production, milk production, and the richness of the milk, have been developed. As between the cat and the dog, the former possesses great fertility and fecundity, but apparently only slight tendency to variation, and hence in all the years that the cat has been domesticated man has not developed from it an animal of much special use beyond that as a pet; while the dog varies so greatly that a number of races have been developed by selection and crossing which differ greatly in character, and many of them have been turned to use in a variety of ways.

Animals differ greatly in their adabtability to domestication. The wild traits seem more firmly stamped on some species than on others. To admit of successful and profitable domestication, they should be of social and docile disposition, and capable of retaining their fertility under changed conditions. Some species will not breed in confinement, or become unproductive. This is often due to inability to observe the natural or customary habits at breeding time, and is observed in some birds. On the other hand, hybrids are more readily produced under domestication. See BREEDS AND BREEDING.

CLASSES OF DOMESTIC ANIMALS. The domestic animals practically all belong to the classes of mammals or birds. The larger number and the more important of the former class are herbivorous, and are kept for their flesh, milk, wool or hair, hide, etc., or as beasts of burden, some species, as cattle, being kept for all of these purposes. The most common of the herbivora are cattle, sheep, goats, the buffalo, yak, reindeer, camel, llama, alpaca (ruminants), and the horse, ass, hog, and elephant (pachyderms). The zebra has been tamed and domesticated to some extent; but, like the elephant, no domesticated race of the species exists. Although the elephant has been much employed for many ages for various purposes in India, the individuals are still taken, to large extent, from the wild denizens of the forest, and this animal can only be said to be half domesticated. The mule, a very important and valuable work-animal, is not a distinct species, but a hybrid, the product of the male ass and the mare, resembling the ass much more than the horse; and the hinny or muto is the product of the stallion and the she-ass, possessing many of the characteristics of the horse. Both of these animals are incapable of reproduction.

Of carnivorous quadrupeds, there are only two which have been generally and thoroughly domesticated—the dog and the cat. These are kept largely as pets and for ornament, although, as noted above, the dog has been bred and trained to many uses, such as herding cattle and sheep, protection of life and property, hunting, and as a beast of burden. Certain species of foxes are kept under domestication in Alaska and bred for their fur; they become tame, but cannot be reckoned among domestic animals in a restricted sense. A long list of other quadrupeds are tamed and kept as pets, and partially or individually domesticated. This is true of the rabbit, guinea-pig, ferret, and mungoos, for example, which are also useful under some conditions. The Belgian hare has recently been kept and bred quite extensively in a number of countries for its flesh.

Of birds, the most important of the domesticated species are gallinaceous—the common barnyard fowls, of which there are many widely different varieties, the guinea-hen, and the turkey; to which should be added ducks, geese, and swans, which belong to the web-footed water-birds. Peacocks and pigeons are thoroughly domesticated, being kept principally for ornament, although the breeding of them is something of an industry; and the pheasants and curassows (guans) are of some local importance, though not truly domesticated. The ostrich has for some time been kept in confinement in Africa, and more recently in California and Arizona, where quite large ostrich farms are operated on a commercial scale. The birds pair, lay eggs, and rear young plentifully under these conditions, and may be said to be partially domesticated. Song-birds, parrots, and similar birds which are kept as pets, cannot be said to be truly domesticated species; nor can a long list of birds which have largely abandoned their wild habits for an association with man, such as the swallows, swifts, and other species. The same applies to rats, mice, snakes, vermin, etc., which have associated themselves with man for protection and their own advantage. Fishes are not generally classed among the domestic animals, although kept by man under quite natural conditions for his pleasure and use; nor are snails, oysters, turtles, etc., to which his care has been extended. These, together with a number of species of useful insects, such as the bee, silkworm, and cochineal-insect, are more properly described as *cultivated* than as *domesticated*.

For further details regarding the description and origin of various kinds of domestic animals, see CATTLE; HORSE; SHEEP; FOWL; GOOSE.

BIBLIOGRAPHY. Darwin, *Variation of Animals and Plants Under Domestication* (London, 1868; New York, reprint, 1897); Shaler, *Domesticated Animals, Their Relation to Man and to His Advancement in Civilization* (London, 1896); Hehn, *Wanderings of Plants and Animals from Their First Home*, trans. by Stallybrass (London, 1888); Low, *Domesticated Animals of the British Isles* (London, about 1846); Wallace, *Farm Live Stock of Great Britain* (Edinburgh, 1889); Sanders, *The Breeds of Live Stock* (Chicago, 1887).

DOMESTIC RELATIONS. A term employed to denote the legal relations subsisting between the members of a family or household; and the law of domestic relations is the group of rules which define and regulate the rights and duties of these members. The separate grouping of these rules is a matter of convenience, rather than the result of an attempt at logical classification. Indeed, every treatise on this topic contains a large amount of material that is taken bodily from the law of agency, of contract, and of tort. In other words, the law of the domestic relations is not in all its parts a distinct and independent branch of the law, but is made up in large part of legal rules from several branches of the law. As thus conceived, it forms a part of the law of persons, in which the ordinary legal relations are varied by the abnormal status of persons under the various degrees of disability or of legal privilege to which the members of a family are subject. But it also includes the rights arising out of the status of the various family relations, as marriage and divorce, the rights of children against their parents, and the like. The topics ordinarily discussed under this general heading, are those of husband and wife, parent and child, guardian and ward, master and servant. It is admitted that the last of these topics carries the discussion far beyond the limits of the modern family or household. For this reason some recent writers on domestic relations have dropped this topic entirely, or limited their consideration of it to the rights and duties of domestic servants. The attempt has been made in some States to codify the rules applicable to this subject. This has been done in New York by a statute known as the Domestic Relations Law. Its scope is fairly indicated by the headings of its various divisions, viz.: Unlawful Marriages; Solemnization, Proof, and Effect of Marriage; Rights and Liabilities of Husband and Wife; The Custody and Wages of Children; Guardians; The Adoption of Children; Apprentices and Servants. See Gilbert, *Domestic Relations* (Albany, 1902); Rodgers, *Domestic Relations* (Chicago, 1899); Schouler, *Domestic Relations* (Boston, 1905); Long, *Domestic Relations* (St. Paul, 1905); Laws of New York, c. 272 of 1896. See also the articles GUARDIAN; HUSBAND AND WIFE; MASTER AND SERVANT; PARENT AND CHILD, and the authorities mentioned under each of these titles.

DOMESTIC SERVICE. By domestic service is meant the work done in and about the house to provide for the physical comfort of its occupants. It includes the labor of housekeepers, cooks, laundresses, chambermaids, waitresses, nurses, butlers, coachmen, footmen, gardeners, choremen and charwomen, and personal attendants.

The condition of household service in different countries varies according to the remoteness of the countries from the feudal state of society and industry. Where the social organization remains aristocratic, there is a class bred more or less definitely to service, at least as to mental attitude. Where democratic conditions prevail, there is no such class. Yet the relation between employer and employed in domestic labor, even in democratic countries, has not resolved itself as it has in other industries. The personal element remains as between the feudal baron and his retainers. The work is done with all the waste of energy and material attendant upon individual effort as opposed to coöperation. The industry is altogether in an involved transition state.

In ancient times the work of the household was done by slaves. In modern times it has been very largely done by the women of the household, and by women employed by them as helpers. To the former fact is largely due the stigma of social inferiority attaching to domestic service, and to the latter its uncertain standing as an industry.

The social status of the household servant is everywhere about the same; but as the democratic form of government is approached the social inferiority which service involves becomes more and more dreaded and despised, and the marks of it more abhorrent to the servant. For instance, it is often difficult to persuade a maid or a nurse in the United States to wear a cap, and English women servants are beginning to protest against that badge; while German and French ones seem, on the contrary, rather proud of their uniforms.

Except where there is a contract specifying other terms, domestic servants in England are hired by the year. Their wages are payable quarterly. Their master is bound to find them suitable lodging and board. The contract, once entered upon, can be terminated only by a month's notice on the part of the servant or the payment of a month's wages on the part of the employer. Immediate dismissal may follow the discovery of immorality, theft, disobedience, extreme inefficiency, or permanent disability. The employer may not legally keep back money from the servant's wages for any breakage, damage, or loss on the part of the servant.

In Germany a two weeks' notice is sufficient to end the service. The employer there is obliged, at the termination of a servant's employment in his house, to register with the police authorities a letter defining the record of the employee while in his service. This is filed in the police book; and as premiums are paid by masters and mistresses for the servants having the best police-book records, it becomes a matter of moment to the servants to maintain good ones. The objection to this system is that the records are not always entirely accurate, although great care is exercised in the matter by the authorities and strict rules are made to govern it. Most of the German servants are drawn from the peasant class, coming from the country to the provincial towns, and thence to the large cities.

In France and Italy conditions do not greatly differ from those of Germany, except that the police-book system is not used. In France more men are employed for household work, and there is less waste than in any other country. Italy and Spain approach more nearly to the feudal system of domestic service.

In Russia, in the country regions, the feudal system prevails. For a piece of land—about two acres—out of the estate, one cow, and the privilege of raising as many pigs and chickens as the serving family desires, a landed proprietor may obtain whole villages of retainers, the services of all of whom are his at his need. In Saint Petersburg most of the household servants are Finns. Here also enough of the feudal system remains to make it no uncommon thing for a servant to remain twenty years in one family's employ.

In the United States, the earliest white servants were the transported convicts and the redemptioners. The redemptioner's services were sold for a term of years to a colonist, either by himself, by one of his creditors, or by the captain of the vessel in which he took passage. In addition to the servants from these two classes, there were slaves, both Indian and negro.

This state of domestic service lasted through the colonial period to the time of the Revolution, when indented service was replaced in the North by free labor, and in the South was entirely superseded by negro slavery.

From the Revolution until the middle of the nineteenth century the servants in the North, except in the great cities, were the social equals of their employers, as is still the case in many parts of the West and Middle West. It was in deference to this equality that the use of the word 'servant' was abandoned and that of 'help' substituted. All suggestion of servitude was abolished. Liveries, even caps, were not worn. The 'help' sat at table with their employers, called the members of the family by their Christian names, and were, in fact, what their name implied—friendly assistants, salaried but independent. This condition of domestic service in the North lasted almost as long as the patriarchal state of slavery in the South.

About the middle of the nineteenth century a change in the state of affairs throughout the United States began with the flood of immigration. The famine of 1846 in Ireland, the German Revolution of 1848, and the conditions preceding and following it, and the treaty of the United States with China in 1844, loosed upon this country an unprecedented number of foreigners. Of the Irish and German immigrants, nearly one-half were women. They entered as 'unskilled laborers.' The household industries have always been sought by unskilled labor. In the East these immigrants entered at once into the serving class. In the West, along the Pacific coast, the Chinese became the competitors of the natives in household labor, working more cheaply and more skillfully, and rapidly displacing such Americans as were engaged in domestic service. These conditions have been somewhat modified by the restrictions on Chinese immigration.

The question of domestic service in the South has been a vexed one since the Civil War. The negroes, long held in servitude and unaccustomed to think for themselves, were suddenly loosed upon the community, and given the same rights and privileges as the whites, without knowledge of how to use them. The habit of submission did much to restrain them, and their inherent tendencies have prevented them from organizing to any great extent. Many of them have come North to compete with the immigrants; but this has had no marked effect upon the conditions of domestic service, nor until recently have many white servants been employed in the South. Those who remained in the South have many of the faults of the slaves, with an independence which makes them insusceptible to control; but time, patience, and education are bettering these conditions.

The foreigners in the East found the field ready for them. The women in New England who had in the early days acted as 'help' in their neighbors' homes were entering the recently established factories in large numbers. In the early times each household had raised not only its own food products, but its own clothing stuffs as well. The home had been cotton and woolen mill, dressmaking and tailoring shop. The development of machinery had taken this class of work out of the house, and many of those who had been accustomed to do it in the house followed it to the mills. It was a more remunerative and more independent occupation than household labor, even under the free and equal régime. The Northern women were glad to give over the household labor to the immigrants, but set themselves the difficult task of adapting European methods to American conditions. With increased wealth came the desire for display, and the patterning of household arrangements after foreign usage. The result was that the word 'servant' came again into use, and domestic service sank in the social scale, while at the same time the immigrants themselves were eagerly imbibing the democratic ideas of their adopted country.

The foreigners have remained practically in control of the American kitchen ever since they took possession of it. The eleventh census report classifies the domestic servants employed in the various parts of the United States by race thus: In the Eastern States 60.89 per cent. of the household servants are foreign or colored; in the Middle States, 55.29 per cent.; in the Southern States, 83.23 per cent.; in the Border States, 68.35 per cent.; in the Western States, 40.02 per cent.; and in the Pacific States, 62.42 per cent. In only one section of the country, then, do native servants outnumber the foreign and negro. Of the foreigners, the Irish are the most numerous, being 37.64 per cent. of the whole number engaged in domestic service, and the Germans are next, being 21.16 per cent. of the whole number.

In the farming districts of the Northern and Western States the old conditions of equality above mentioned still prevail. The farmers' wives do their own work, with the help of a 'hired girl,' and the farmer employs for his field work and chores a 'hired man.' Both of these are practically members of his family and his social equals, as they are often sons and daughters of his neighbors. Household servants are found mainly in the large cities, partly on account of the congregation of wealth there, and partly on account of the servant's rooted objection to the country—an objection which is doubtless partly due to the foreigner's desire not to be completely isolated from all her kind as well as from her home. In the fifty largest cities of the United States, 18.04 per cent. of the total population of the country is to be found, and 32.32 per cent. of the domestic servants of the country. The wages vary with the region, the Pacific Coast paying much more than the Eastern States, and these in turn more than the Southern States. The average rate paid to household servants on the Pacific Coast is $4.57 a week, against $3.60 in the East and $2.22 in the South. Cooks are the best paid of all domestic servants.

In England and on the Continent, wages are much smaller for household labor than in the United States. Four dollars a week, which is lower than the Western and only a little higher than the Eastern average, is a phenomenally high rate there. In addition, in some parts of the Continent, servants are not necessarily boarded from their employers' tables, and the English may or may not be, as the agreement specifies. 'Board wages' are paid instead, and they are very small, sometimes not more than 20 cents a day. Even when food is provided by the employer, it is not likely to be of the some variety as that which serves his own table. 'Beer money' and 'tea money' are generally stipulated for in English contracts. But the European servants, even in small establishments, have a means of revenue which only the servants of the wealthy or of corporations have here. Tips from guests are a recognized source of income; and the German maid, for instance, lighting a caller to the front door of a modest apartment house in Berlin, would feel defrauded unless she received her small fee.

The advantages enjoyed by household servants in this country are many. They are generally lodged more comfortably than they would probably be otherwise. Numerous as are the complaints against 'the girl's room' of a small establishment, it is usually moderately comfortable. The food is generally good. The wages, considering that lodging, light, heat, board, car-fare, and expensive dress are not to be provided from them, are much better than shop and factory wages, and do not compare badly with the salaries of teachers. On the other hand, household servants have practically no chance to rise in their occupation; they are isolated, both industrially and socially. They have almost no personal freedom, and their standing is regarded as lower than that of other women workers.

Mistresses complain of the uncertainty of the whole situation; there is no fixed rate of wages, no fixed term of service, and no fixed standard of excellence.

Various remedies have been suggested to meet these difficulties, none of which have proved entirely adequate. Some advocate a return to the more patriarchal system of the past, and believe in making the relations between mistress or master and servant a more personal one. Some have advocated a 'shift system' for servants—setting each to work for only eight hours, and then relieving him or her by another. This plan has been successfully adopted in Chicago by a very rich woman. It would, in its present form, be possible only to the very wealthy, or to an organization of some sort.

Others advocate the abolition of all individual domestic labor. Neighborhood nurseries for the children, with neighborhood kitchens and dining-rooms for the adults, seem to them to solve the problem. This, the coöperative housekeeping scheme, has been often tried, and generally with a signal lack of success. The failures, however, seem to have been due rather to mismanagement or to too sweeping and hurried changes than to any inherent impossibility in the plan. Thus, though one of the first arrangements of this sort tried in America, at Cambridge, Mass., in 1871, was not a success, a similar effort on a modified plan, in Brookline, Mass., twenty-five years later, has not been a failure. This is the Beaconsfield Terrace Scheme—a business affair, rather than a sociological experiment, in intention. The residents of the terrace have, in addition to their own yards, an inclosed park in common. They share tennis courts; a casino, where any one of them may entertain on a larger scale than in his own home; the services of a choreman; the time of a superintendent of the buildings; and so on. Their heat is supplied from a central engine-room and not from individual furnaces. The difficulty with coöperative housekeeping is that most persons instinctively object to it on the ground of lack of privacy. They feel that they will be deprived of their homes and given instead an improved boarding-house system, and that under these conditions their children cannot develop properly. Many, too, see in such plans danger of being victimized by 'cranks' and people of uncertain social views.

Some of those who look forward to the amelioration of domestic service believe that it will be brought about by the establishment of training schools for household servants. So far, however, industrial training schools have received little patronage from the class for whom they are intended. The servants themselves fail to perceive the importance of training, since they can obtain good wages without it, and their ambition is not stimulated by the possibility of rising in the social scale through such training.

In England, some schools designed and endowed to prepare girls for household service have become sewing and dressmaking schools, under the dislike of the girls and their parents for household labor. In Belgium, schools of industrial training have been instituted by the Government, and are run under Government inspection and control. They have succeeded much better than the private enterprises of other countries, although they are for general household training and not specifically for that of servants.

Profit-sharing has also been tried in the household, and has on the whole proved successful. The plan is to set aside a certain amount for housekeeping, and divide what can be saved out of it between the mistress and the servants according to a proposition previously agreed upon. This of course gives the servants an interest in the welfare of the household, and has the same advantages and disadvantages as a similar system in business.

Another solution for the domestic-service problem lies in the modern tendency toward specialization. Many kinds of work formerly done in the house, under the supervision of its mistress, are now provided for outside of it. Trained workers take up some special branch of household labor and contract for it with a number of families. It does not appear as yet that specialization will solve the problem altogether.

The servants' unions which have been organized have not yet accomplished anything serious. Nevertheless, it is the opinion of almost all students upon this subject that along this line—the organization of the industry upon a practical business basis, with a regular scale of wages for various grades of skilled and unskilled work, with fixed hours for work and the stigma of servitude removed—lies the hope of betterment. Such a system would necessitate proper training on the part of those who wished to share in the benefits of the organization and many concessions on the part of employers.

BIBLIOGRAPHY. Salmon, "Domestic Service," which contains a bibliography, in *Eleventh United States Census Report* (Washington, 1892-94); Baylis, *The Rights, Duties, and Relations of Domestic Servants* (5th ed., London, 1896); Graham, *Master and Servant* (London, 1899); Addams, "A Belated Industry," in *American Jour-*

nal of Sociology, vol. i. (Chicago, 1896); Walker, *The Wages Question* (New York, 1886); Schloss, *Report on Profit-Sharing* (London, 1894); Herrick, *Expert Maid Servant* (1904).

DOM'ETT, ALFRED (1811-87). An English poet and colonial statesman, born at Camberwell Grove, Surrey. He studied at Saint John's College, Cambridge, in 1829-33, and in 1837-39 contributed to *Blackwood's* several poems, of which the best known is "A Christmas Hymn." In 1841 he was called to the bar, and in 1842 went to New Zealand as one of the earliest settlers in that colony. There he held many public offices, including those of Civil Secretary (1851), Commissioner of Crown Lands and Resident Magistrate at Hawke's Bay (1853-56), and Prime Minister (1862-63). In 1871 he returned to England. He is the subject for Browning's poem "Waring." Browning's "The Guardian Angel" also addresses him. His publications include: *Ranolf and Amohia: A South-Sea Day Dream* (1872), and *Flotsam and Jetsam* (1877). Consult Gisborne, *New Zealand Rulers and Statesmen* (London, 1897).

DOMETT, Sir WILLIAM (1754-1828). An English admiral. He entered the navy in 1769, was made lieutenant in 1777, and during the American Revolution took part in various engagements with the French and Americans. He was appointed captain of the Baltic fleet in 1801, and soon afterwards of the fleet off Brest. He was made admiral in 1819.

DOMEYKITE. A copper arsenide occurring in massive forms with a metallic lustre and white to gray in color. It occurs in Chilean mines, also at Zwickau in Saxony, and in the copper deposits of Michigan. Domeykite derives its name from the Chilean mineralogist, Ignacio Domeyko.

DOM'ICEL'LA. See LORY.

DOMICILE (Lat. *domicilium*, from *domus*, house). The legal residence of a person. Though used in common speech as synonymous with 'home' or 'place of abode,' in the strict legal sense 'domicile' denotes the place which the law will hold to be a man's residence; and this may or may not coincide with the place where he in fact usually or habitually resides. It is a doctrine of modern law that every person shall have a definite location in some jurisdiction, to which his legal rights and obligations may be referred, and by which his legal status, public and private, is determined. The name and the notion of domicile, as well as the necessity for it, are comparatively recent, and arise from the modern conception of law as being of territorial rather than of personal obligation. Formerly the important question was that of nationality, it being conceived that every person was entitled to be judged and to have his rights and obligations determined by the law of his national allegiance, rather than by that of his actual domicile. But the complete triumph of the principle that the authority of a State extends to every one within its borders, irrespective of his nationality or citizenship, and that it is in the main confined to those limits, has given a new importance to the question of domicile.

As the private and local law by which a person is governed, as well as his political status, now depends almost entirely on his domicile, the question of what facts of residence and intention shall determine the domicile has been extensively discussed by the courts and law writers. The importance of the subject in international law has called for its especial consideration by the authorities in that field of jurisprudence.

Vattel defines domicile as habitation fixed in any place with an intention of *always* staying there. This definition is now regarded as too limited by most authorities on international law, certainly by the best writers on the subject in the United States. It is held that in a newly settled country like the United States, absolute permanence of residence is rare, and it is sufficient to constitute a domicile that the habitation be fixed without any present intention of removing therefrom. Justice Story says: "Two things must concur to constitute a domicile—first, a residence, and, second, the intention of making it the home of the party;" to which Dr. Woolsey adds: "And when once a domicile is acquired it is not shaken off by occasional absences for the sake of business or pleasure, or even by visits to a former domicile or to one's native country." It follows that the same person may be a citizen of one country, possess a domicile in another (for the questions of domicile and citizenship are quite distinct), and temporarily reside in still a third. Another American authority, Wharton, distinguishes three kinds of domicile: domicile by birth, by choice, and by operation of the law; and this classification is now generally accepted. The first is determined by the place of nativity, the second is acquired by a man's own volition, and an illustration of the third is the domicile of a wife, being that of her husband acquired by her at the time of marriage. A child, of course, has the domicile of his parents, and is considered incapable of changing his domicile of his own accord; but he follows any change in the domicile of the parents. When the father of a family dies, the domicile of his children and widow continues to be that of his last residence until a new one is acquired in any of the ways already indicated. The question as to what amounts to a sufficient intention of permanent residence to cause an immediate change of domicile is one of no little difficulty, which must be determined by the special facts of each case.

In its relation to private rights and obligations the rule may be laid down in a general way that the law of the place of domicile governs in contracts relating to personal property and in the matter of wills and bankruptcy; while, on the contrary, in matters relating to real estate the law or the place of its situation (*lex rei situs*) prevails. In England it was formerly held that it was necessary to the validity of a will that it should be executed according to the law of the testator's domicile, no matter where the will was drawn; but statutes now provide that the will is valid if executed in accordance with the law of the country where it was made, even though it do not conform to the law of the place of permanent and recognized domicile. Similar provisions exist in most or all of the States in this country. See CONFLICT OF LAWS.

The question of domicile is often of importance in determining property rights in time of war. Thus it is held that the property of an alien domiciled in a country with which his own nation is at war is subject to seizure as that of an alien enemy. Under a strict construction of the common law, also, an alien cannot (regardless of the existence of war or peace) hold land, either by purchase or inheritance; but in many of the American States this rule has been directly abolished by statute as opposed to the natural policy of this country, and in others it has become obsolete by general consent. (See ALIEN.) Under the Roman or civil law it was considered that a man might legally hold two domiciles, as when he resided part of the year in one place and part in another, or when he maintained two businesses in separate places; but, as has been explained above, the modern law of Europe and America has no room for this conception. In matters of taxation and in the application of the poor laws the term domicile is often used, sometimes loosely, and its definition is often of importance in deciding such matters; the courts will often in treating such questions give the word the more restricted meaning that is attached to the words dwelling-place, home and residence. It has been held by several American courts that the domicile of a sailor is the place where he voluntarily spends most of his time when on shore. See ALLEGIANCE; CITIZEN; SUBJECT.

The authorities are numerous. The most important are Dicey, *The Law of Domicile* (London, 1879); Dicey, *Conflict of Laws* (London, 1896); Round, *English Law of Domicile* (London, 1861); Westlake, *Private International Law* (4th ed., London, 1905); Moore, *Digest of the International Law of the United States* (Washington, 1903); Stocquart, *Studies in Private International Law* (Brussels, 1900).

DOMINANT (from Lat. *dominari*, to rule, from *dominus*, lord; connected with Gk. *δαμᾶν*, *daman*, Skt. *dam*, to subdue, OHG. *zam*, Ger. *zahm*, Icel. *tamr*, AS. *tom*, Engl. *tame*). In music —(1) The fifth tone of the scale. (2) *Dominant chord*, the triad upon the fifth degree. So in the key of C it is g-b-d. It is always a major chord in both major and minor keys. (3) *Dominant seventh*, a chord obtained by adding a minor seventh to the dominant triad. Its resolution is determined by the third, which, being the leading-tone (q.v.) of the scale, moves a half step upward; and the seventh, which always descends a half step. In the key of C the dominant seventh is g-b-d-f; the resolution, g-c-e. (4) The *key* of the dominant is the one most closely related to the tonic key. Next comes the key of the fifth below or sub-dominant. All the tones of the scale can be regarded as component elements of these three fundamental chords, thus:

Sub-Dom. Dom.
F A C E G B D
Tonic

DOMINE QUO VADIS, dō'mē-nā kwō vä'dēs. A small church on the outskirts of Rome on the Appian Way, named from the tradition that when Peter was fleeing from persecution in Rome, he was met at this place by Christ going toward the city. Peter, astounded, asked: "Domine, quo vadis?" (Lord, whither goest thou?) The Saviour answered: "To Rome, to be crucified again;" and the Apostle in shame retraced his steps to the city. In the church is shown a stone bearing a copy of the footprint of Christ.

DOMINGO, dō-mĕn'gō, SAN or SANTO. See SANTO DOMINGO.

DOM'INIC, SAINT (1170-1221). The founder of the Order of Preaching Friars (*Fratres Prædicatores*), in the Roman Catholic Church. He was born at Calahorra in the north of Spain, probably of the illustrious Guzman family. He studied theology in Palencia, and in 1195 became canon of Osma in Castile. With his superior, Diego de Azevedo, Bishop of Osma from 1201, he made several journeys, one as far as Denmark. On their way back to Spain from a visit to Rome they found at Montpellier three Papal legates debating on the means to be adopted for the suppression of the Albigensian heresy, and recommended as the most efficient means the setting of a notable example of humility and self-denial. Dominic, with his bishop, began to preach throughout Languedoc, and in the following year founded at Prouille his first institution, an asylum for poor girls who were in danger of changing their faith through lack of means to resist the inducements held out by the rich and powerful adherents of the new belief. Whether he took part in the crusade of extermination against the Albigenses headed by Simon de Montfort after the murder of the Papal legate, Peter of Castelnau, is not known; but he labored incessantly for the conversion of the people at all times. From 1215 his life was spent in arduous work in connection with the Order which he founded in that year. (See DOMINICANS.) After holding the second general chapter of the Order at Bologna in 1221, he had made up his mind to preach the Gospel among the heathen Cumans, a Ugric tribe in Hungary, and, if possible, to gain the crown of martyrdom; but he died on August 6, at Bologna, where his body is buried in the Church of Saint Nicholas. Pope Gregory IX. canonized him in 1234. Consult: The original Life by Jordanus, *De Principiis Ordinis Prædicatorum*, ed. J. Berthier (Freiburg, 1892); Lacordaire, *Vie de Saint Dominique* (Brussels, 1841; Engl. trans., London, 1883); Drane, *The Life of Saint Dominic* (3d ed., London, 1891); Herkless, *Francis and Dominic* (New York, 1901); Guiraud, *Saint Dominic* (New York, 1901).

DOMINICA, dō'mē-nē'kȧ, or **DOMINIQUE**, dŏm'ĭ-nēk'. One of the British West Indies, the largest of the Leeward group, lying between the French island of Guadeloupe on the north and Martinique on the south (Map: West Indies, R 7). Area, 291 square miles. It is mountainous, containing the highest peaks found in the Leeward group, which rise to a height of over 5000 feet. Its irregular surface, together with the subterranean vapors and boiling lakes, prove the volcanic origin of the island. The soil is well watered and in some parts highly fertile. The chief products are coffee, cacao, cotton, indigo, sugar, and several kinds of fruit. The imports usually exceed the exports; in 1904 their value was £91,088 and £63,016, respectively. Dominica forms a Presidency of the Leeward group and sends two members to the Federal Legislative Council at Antigua. Locally, the island is administered by a Governor, assisted by an executive council of ten members. Prior to 1898 the Legislative Assembly was partly representative, but since then it has consisted of six official and six unofficial members, nominated by the Governor. Population, in 1891, 26,841; in 1904, 30,790, mostly colored, including 400 descendants of the Caribs, of whom 120 are pure-blooded. Roseau, the capital, is a fortified town and port with a population of about 5000, and has a

United States consul. Dominica was discovered by Columbus, November 3, 1493, and was so named on account of being first sighted on Sunday. It was owned by England and France, alternately, until 1814, when in fell into the hands of the English. See BRITISH WEST INDIES.

DOMINICALE, dô-mĭn'ĭ-kā'lê (ML., from *dominicus*, relating to the Lord, from *dominus*, lord). A rare term, probably denoting a white linen cloth in which, at communion, during the early ages of the Western Church, women received the sacred host ('the body of the Lord,' hence the derivation), which as late as the eighth or ninth century was placed in the hand of the communicant, not in the mouth as in modern Roman Catholic usage. Ducange and others, however, apply the word to a veil worn by women in church.

DOMIN'ICAL LETTER, or SUNDAY LETTER. One of the seven letters A, B. C, D, E, F, G, used in calendars to mark the Sundays throughout the year. The first seven days of the year being marked in their order by the above letters in their order, then the following seven, and all consecutive sets of seven days to the end of the year, are similarly marked; so that the 1st, 8th, 15th, 22d, etc., days of the year are all marked by A; and the 2d, 9th, 16th, 23d, etc., by B; and so on. The days being thus marked, it is evident that on whatever day the first Sunday of the year falls, the letter which marks it will mark all the other Sundays in the year, as the number of the letters and of the days in the week is the same.

As the common year consists of fifty-two weeks and one day over, the dominical letters go backward one day every common year. If the dominical letter of a common year be G, F will be the dominical letter for the next year. As a leap-year consists of fifty-two weeks and two days, the letters go backward two days every leap-year. If in the beginning of a leap-year the dominical letter be G, E will be the dominical letter for the next year. This extraordinary retrocession, however, is made to take place at the intercalary day (the 29th of February) by the artifice of marking it by the same letter as the day preceding it, and thus the next Sunday is marked by the letter preceding that which marked the Sundays before the intercalary day. Suppose the 28th of February in a leap-year to be a Sunday, and marked by F, it is evident that the dominical letter for the rest of the year will be E. As every fourth year is a leap-year, and the letters are seven in number, it is clear that the same order of letters must return in four times seven, or twenty-eight years, which would, but for the leap-years, recur in seven years, and hence the solar cycle. (See PERIOD.) The dominical letters were first introduced into the calendar by the early Christians, to displace the nundinal letters in the Roman calendar. They are of use as a means of discovering on what day of the week any day of the month falls in a given year. (See EASTER.) Rules and tables for finding them are given in prayer-books, breviaries, etc., as well as in works on dates.

DOMIN'ICANS. An Order of preaching friars (the Latin name is *Ordo Prædicatorum*) in the Roman Catholic Church. It was founded by Saint Dominic (q.v.) in 1215, for the purpose of counteracting, by means of preaching, the tendency of the times to break away from the Church. When in Rome seeking confirmation for his Order, which was delayed on account of the opposition of the Fourth Lateran Council, just concluded, to the multiplication of new religious organizations, the founder met Saint Francis of Assisi, who was engaged in a similar work. A cordial friendship sprang up between the two men, different as they were in temperament; to this day its memory is preserved in the custom of the priests of each Order celebrating the feast of the founder of the other in his own church. Both Orders differed from the older ones in emphasizing more strictly the spirit of poverty and rejecting the possession of even community property. Hence they are called mendicant Orders, as they originally depended for their subsistence entirely on the daily charity of their neighbors. The name of monks is often incorrectly applied to them; the proper designation of both Franciscans and Dominicans is friars (Lat. *fratres*, brothers). The requisite Papal confirmation was obtained from the new Pope, Honorius III., at the end of 1216; with it went special privileges, especially the right to preach and hear confessions everywhere, without local authorization. The first house of the Order was at Toulouse, from which in the summer of 1217 Dominic sent some of his sixteen associates to spread the movement in Spain and France. From the name of their first convent of Saint Jacques in Paris, they were popularly known in the latter country as Jacobins—a name which was to acquire a new and sinister significance in the Revolution. They were introduced into England within six years, and founded a house at Oxford. Here they were known as 'Black Friars,' from the habit which they wear outside the convent, in preaching and in hearing confessions—a black cloak and hood over a white woolen undergarment. "The monks," writes Matthew Paris, himself a Benedictine, "did not in three or four hundred years ascend to such a height of greatness as the friars minor and preachers, within twenty-four years after they began to build their first house in England." (See Jessopp, *The Coming of the Friars*, London, 1888.) Their progress was scarcely less rapid in Scotland, where they found a munificent patron in King Alexander II., who is said to have met Saint Dominic in Paris. They soon spread as far as Russia and Greece, and in 1280 even to Greenland.

In accordance with the declared purpose of their foundation, the Dominicans have always been known as diligent preachers and strenuous combatants against any departure from the teaching of their Church. In this capacity they were intrusted with the conduct of the Inquisition as an ecclesiastical institution; and even in Spain, after it became practically a department of civil government, a Dominican was usually at its head. The office of master of the sacred palace, endowed with great privileges by Leo X., has always been held by a member of the Order; and since 1620 the censorship of books has been one of its functions. In 1425 the permission to hold property was granted by the Pope to certain houses, and extended to the entire Order in 1477, since which time they have been less exclusively a mendicant Order. They have furnished four popes (Innocent V., Benedict XI., Pius V., and Benedict XIII.), and more than sixty cardinals. Outside of their specific work, they did much for the development of art. Their cloister at Santa Maria Novella, in Florence, was a veritable school of architecture. Painting was also cultivated with great success at San Marco in the same city, and at Santa Caterina in Pisa; and the names of Giovanni da Fiesole, better known as Fra Angelico, Benedetto da Mugello, and Bartolommeo della Porta are worthy of remembrance. (Consult Marchese, *Memorie dei più insigni pittori, scultori e architetti domenicani*, Bologna, 1878.) Their chief glory in theological learning is Saint Thomas Aquinas (q.v.), whose teaching has been especially commended by Leo XIII. as the standard of dogmatic theology; other distinguished teachers were Albertus Magnus and Raymond of Peñaforte, the third general of the Order. Their great rivals in the later Middle Ages were the Franciscans. These two Orders divided the paramount influence in the Church, and often in the Catholic States, not without frequent hostility on the part of the parochial clergy, who felt their rights invaded by the friars; but the rise of the Jesuits lessened their power both in the schools and in the court. In the eighteenth century they possessed not less than a thousand houses in all parts of the world. The troubles of the latter part of that century, however, decreased their number considerably. In France the Order was revived largely through the efforts of the famous Lacordaire (q.v.), the centenary of whose birth was solemnly celebrated in 1902 as that of 'the restorer of the Dominican Order in France.' In England and Ireland they have (1906) 21 houses for men and 13 for women. They played the leading part in the evangelization of Spanish America. Introduced into the United States in 1805, they have here (1906) 20 houses for men, while the Dominican sisters have 24 motherhouses, each with several succursal houses. At the head of the whole Order stands the general (*magister generalis*), whose term of office since 1862 has been twelve years; since 1273 he has had his residence at Santa Maria Sopra Minerva in Rome. There are fifty-two provinces (each with a provincial at its head), though some of these are now merely nominal.

The female branch of the Order may claim, in a sense, greater antiquity than the male, since Dominic founded his house at Prouille in 1206; but after the friars were established, the members of his community modestly called themselves the second Order. Another house was founded at Rome in 1218, Dominic being commissioned to unite a number of small or private associations in the authorized system of his rule. The cloister of San Sisto, given him by the Pope for this purpose, is thus really the first in which the Dominican habit was worn by women. The Order was originally intended to be contemplative, but in later years, together with some relaxations of the rule, its scope was extended so far as to include the education of girls and other practical works. The nuns are not numerous, since the revolutionary movements of the latter part of the eighteenth century destroyed the greater part of their houses; but a certain number of new convents has sprung up in the nineteenth century, especially in Bavaria. The third Order was organized by Saint Dominic in 1220, to provide a constant supply of defenders of the Church against the assaults of the Albigenses and other turbulent innovators. He gave it the name 'militia of Jesus Christ,' and pledged its members to defend the Church with their arms and their possessions. Married men could not be received into the brotherhood without the consent of their wives, who were bidden to pray for the success of the men. The enthusiasm of the Middle Ages soon brought large numbers, to whom the founder gave a few simple rules for holy living. After the necessity of this militant life passed away, the members were unwilling to dissolve their association, and continued it as against spiritual foes, naming themselves 'brothers and sisters of penance.' Their numbers increasing rapidly, the seventh general of the Order, Munio de Zamora, reduced the rules given by the founder to a systematic form, in which they were confirmed by Pope Innocent VII. in 1405 and Eugenius IV. in 1439.

Some members have maintained a cloistered life, but the majority have been men and women living a devout life in the world. The third Order has produced numerous saints, including Saint Catharine of Siena, and the first American saint, Rose of Lima. On the history of the Dominicans in general, consult: Caro, *Saint Dominique et les Dominicains* (Paris, 1853); Danzas, *Etude sur les temps primitifs de l'ordre de Saint Dominique* (Paris, 1874, et seq.); Drane, *The Life of Saint Dominic, with a Sketch of the Dominican Order* (3d ed., London, 1891); Proctor (editor), *Short Lives of the Dominican Saints* (New York, 1901); *Monumenta Ordinis Fratrum Prædicatorum Historia* (Stuttgart, 1900, et seq.). For further details of both Dominican and Franciscan third Orders, see TERTIARY.

DOMINIE (dŏ′mĭ-nê) **SAMPSON**. A faithful schoolmaster in Scott's *Guy Mannering*, the tutor of Bertram's children. He is awkward, but honest, and devoted to books, and is famous for his constant ejaculation, 'Prodigious!'

DOMINION, THE OLD. Virginia. See STATES, POPULAR NAMES OF.

DOMINION OF CANADA. See CANADA, DOMINION OF.

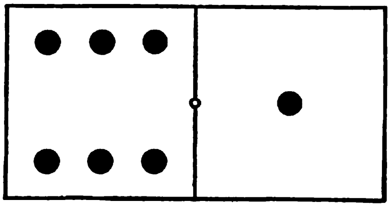
DOMINIQUE. A breed of domestic fowls very similar in plumage to the barred Plymouth rocks. Both cocks and hens have rose combs and bright yellow legs. They have excellent qualities, and weigh from 6½ to 8½ pounds.

DOMINIS, dŏ′mê-nês, MARCO ANTONIO DE (1566-1624). An Italian ecclesiastic. He was born on the Island of Arbe, on the coast of Dalmatia, and was educated by the Jesuits at Loretto and Padua, winning distinction by his ability and the varied character of his studies. He taught mathematics at Padua and logic and rhetoric at Brescia. He finally refused to become a Jesuit, and for several years was a popular preacher. In 1596 he was appointed Bishop of Segni, in the State of Venice, and in 1598 Archbishop of Spalatro and Primate of Dalmatia and Croatia. He quarreled with the Pope, and, having exhibited certain Protestant leanings, found it expedient to resign his post. In 1616 he went to England, and, being regarded as a convert from Catholicism, was well received. James I. appointed him dean of Windsor and master of the Savoy in 1617. The same year he published the first part of his great theological work, the *De Republica Ecclesiastica*, in which he endeavored to show that the Pope had no supremacy over other bishops, but was merely *primus inter pares*. For a time he posed as a violent opponent of Catholicism. But in 1620 he began to negotiate a return to his old faith. He arrived at Rome in 1622, and was well received at first, but a charge of heresy was brought against him in 1623. He was imprisoned in the Castle of Saint Angelo, and died there September 28, 1624. Being subsequently condemned as a heretic, his body was raised from its grave and burned, with his portrait and books, December 21, 1624. In his *De Radiis Visus et Lucis in Vitris Perspectivis et Iride* (1611), written while he was at Padua, Dominis was the first to approximate to the true scientific explanation of the rainbow. His *Reasons for Leaving the Church of Rome* are translated in Somers's *Tracts;* his *Motives for Renouncing the Protestant Religion* (1623) was published in English translation, 1627. Consult *A Relation Sent from Rome of the Process, Sentence, and Execution Done Upon the Body, Picture, and Books of Marco Antonio Dominis After His Death* (1624).

DOMINIUM (Lat., lordship). At Roman law, *dominium* meant ownership, or private right over a thing, whether immovable or movable. More precisely, *dominium* was the general right, as opposed to any special right, such as servitude or lien. It included the power of use and abuse, of alienation and of testamentary disposition; but limitations might be imposed upon the owner in his own interest (e.g. in case of non-age or insanity) or in the interest of neighbors or of the public generally. As regards slaves, restrictions were imposed upon the owner in the interests of humanity. In the narrowest and most technical sense, *dominium* was ownership vested by the old civil law (*ex jure Quiritium*), as opposed to the substantially equivalent right created by prætorian law. (See CIVIL LAW.) It was said that the prætor could not grant ownership, but only possession of the property (*bonorum possessio*), and that the ownership remained with the civil-law owner, although his title was a naked one (*dominium nudum*). *Dominium*, at Roman law, was never confused with *imperium*, or sovereignty; and when it was said that the lands of conquered subjects of Rome were in the *dominium* of the Roman people, this meant that, in legal theory, the land was owned by the Roman people, and that the provincials were merely possessors, holding at the pleasure of the Roman people. *Dominium* could be held by two or more persons jointly, but in such case the joint owners (*condomini*) were always coproprietors with similar rights. Ownership could not be so divided that different powers should be attributed to different persons and each be regarded as *dominus*. During the Middle Ages, however, the right of the feudal superior to a fief was described as direct ownership (*dominium directum*) and the right of the vassal in possession was termed beneficial ownership (*dominium utile*). In connection with the base tenures, also, the same terms were respectively applied to the right of the landlord and the right of the tenant. To the supreme feudal lord was attributed eminent domain (*dominium eminens*). These uses of the word *dominium* were due to the feudal confusion of political with proprietary powers, and with the dissolution of the feudal system this ambiguity disappeared; but the term eminent domain has been retained to describe the exercise of governmental authority over property, particularly in the case of expropriation. By writers on international law *dominium* has been used in the sense of sovereignty, and the whole doctrine of acquisition and loss of sovereignty over territory was worked out, by Grotius and his successors, under the head of *dominium*. In this process many rules were derived, by analogy, from the rules of the Roman law regarding acquisition and loss of ownership. See EMINENT DOMAIN; FEUDALISM; PROPERTY. Consult the authorities referred to under PROPERTY; INTERNATIONAL LAW; CIVIL LAW.

DOMINO. See MASK.

DOMINOES (so called, apparently, from the color of the back of the pieces, which is black, like a domino). A game partly of chance and partly of skill played by any number of people from two to a dozen, but most often by two, with twenty-eight oblong pieces of ivory, bone, or wood, plain black on the back and white on the front marked with black dots in two divisions on the front, one set of dots on one side of a line dividing the centre, and the other on the opposite side of the line. One of these dominoes is blank on both divisions, the remainder are numbered from double six; i.e. six in each division, down through the scale, 6-5, 6-4, 6-3, 6-2, 6-1, and so on, 5-5, 5-4, 5-3, 5-2, 5-1, through all the other numbers. Before beginning to play, the twenty-eight pieces are turned face downward, and shuffled or mixed up on the table, so that the position of no special piece can be recognized. Then, according to the particular game about to be played, the whole, or a certain proportion of the dominoes, is selected, one at a time, by the respective players. Each player sets his dominoes up on edge so that they cannot be seen by the opponent, and examines their markings. Whatever dominoes are not drawn form the stock or reserve. The first player places one piece face upward on the table, and his opponent must place against it 'a match,' i.e. a piece out of his hand corresponding in pips at one end or the other with the piece laid down —for instance, if a piece is laid down with six on one division and two on the other, the second player must *pose* or lay against it any piece in his hand which has either of these numbers on it (such as a two and five, or a six and three) —then the first player (in a two game) must in his turn match, or pose, from his hand, a domino to meet the new combination of pips— there being always two ends for him to select to match. If he has no number corresponding to either end he 'passes' and the opponent plays again; or, if he is playing the 'draw' game (a game in which less than the whole number of



A DOMINO.

dominoes was originally dealt), he may draw on stock up to, but never including, the last two dominoes. Thus the game goes on until one of the players has put out all his dominoes and can neither 'match' nor 'draw.' The one who has the smallest number of pips on his unexhausted dominoes wins, or in case of an equality of pips, he who has the fewest dominoes left, wins. The other varieties of the game are the 'draw game,' and its variation 'matador;' 'the black game' and its variations; the 'block game' and its variations, 'muggins,' or 'all fives,' 'all threes,' 'Sebastopol,' 'tiddle-a-wink,' 'domino pool,' and various other miscellaneous games. The game was not known in Europe until the middle of the eighteenth century, but it has spread all over the world. The rules in detail will be found in Spalding's *Home Library* (New York, 1895).

DOMITIA (dô-mĭsh'ĭ-à) **GENS** (Lat., Domitian family). A plebeian family in Rome, famous under the later Republic. It had two branches—the Calvini and the Ahenobarbi. Of the latter branch, the Emperor Nero was the last male representative.

DOM'INUS (Lat., lord). (1) At Roman law, the owner, the person who holds *dominium* over a thing—including, of course, the master of a slave. (2) In Roman popular speech, a form of respectful address, like our 'sir.' (3) In the Imperial period, a title given to the Emperor. In the early Empire, however, the use of this title was thought servile, and to demand it or even permit it was considered despotic. See DOMINIUM.

In legal phraseology, the *dominus litis* is the person really interested in the issue of an action, though not necessarily the nominal plaintiff (*actor*) or defendant (*reus*).

DOMITIAN, dô-mĭsh'ĭ-*a*n, TITUS FLAVIUS DOMITIANUS (51-96). Emperor of Rome from A.D. 81 to 96. He was the son of Vespasian, and younger brother of Titus, whom he succeeded on the throne. The earlier years of his reign were on the whole advantageously occupied for the public benefit. Many good laws were passed, the provinces carefully governed, and justice rigidly administered. As he grew older, however, his ambition, his jealousy, and his pride, wounded by the failure of his campaigns against the Dacians (who were led to victory by their King, Decebalus) and the Marcomanni, began to instigate him to the most atrocious cruelties. By murder or banishment, he deprived Rome of nearly every citizen conspicuous for talent, learning, or wealth. To win the army, he greatly increased the pay of the soldiers, and secured the favor of the people by prodigal largesses and gladiatorial shows and games, in which he sometimes took part in person. His cruelties became at length so intolerable that a conspiracy, encouraged by his wife, Domitia, whom he had doomed to death, was formed against him, and the tyrant was assassinated. Consult biographies by Imhoff (1857) and Gsell (1894).

DOM'NUS. See DONUS.

DOMODÒSSOLA, dŏ'mô-dŏs'sô-là (ancient Oscela). A picturesque town at the Italian end of the Simplon Pass, on the Toce, which flows into Lago Maggiore (Map: Italy, C 1). The adjacent Mount Calvary is covered with tiny chapels that are visited by pilgrims and commands an inspiring view. Population, 1901, 5016.

DOMREMY-LA-PUCELLE, dôɴ'rā'mā'là-pụ'sĕl' (Fr., Domremy of the Maid; so named in honor of Joan of Arc). A village in the Department of Vosges, France, on the left bank of the Meuse, about seven miles north of Neufchâteaụ (Map: France, M 3). It is famous as the birthplace of Joan of Arc, whose cottage, adorned with the royal arms of France and those of the family of the heroine, is still in existence. There is a bronze statue of Joan in front of the church. The modern basilica of Le Bois Chenu with a statue of Joan by Allard, on a hill near the village, marks the spot where the Maid of Orleans received the spiritual mission to deliver her country from the enemy. The village was freed from all taxes by Charles VII. on account of its brave daughter, and enjoyed this privilege until the Revolution. Population, in 1901, 308.

DON. A river of southern Russia, rising in a small lake in the Government of Tula (Map: Russia, E 4). It flows in a general southeastern direction, through the governments of Tula, Ryazan, Tambov, and Voronezh, and, after describing an arc across the Province of the Don Cossacks, where it approaches within 37 miles of the Volga, it enters the Sea of Azov at the town of the same name. Its total length is over 1150 miles, of which 800 are navigable. In its upper course the Don flows through a low country, which is subject to overflow in the spring. The lower course is through a more elevated region. The chief tributaries of the Don are the Donetz and the Sosna from the right, and the Voronezh, Medvieditza, and Manitch from the left. The Don is connected with the Volga by a canal. The river is very rich in fish; the freight carried by it consists chiefly of grain, lumber, and cattle. The principal port is Rostov. The Don is the Tanais of the ancients.

DON, or **DUN**. A river of the West Riding of Yorkshire, England, rising in the moors on the borders of Derbyshire and Cheshire (Map: England, E 3). It flows 55 miles, first southeast to Sheffield, and then northeast by Rotherham, Doncaster, and Thorne, to its junction with the Ouse at Goole. Its chief tributaries are the Rother, Dearne, and Wente. It is navigable for the last 39 miles of its course below Sheffield, by the aid of canals.

DON. A river of Aberdeenshire, Scotland, rising in a peat-bog, nearly 2000 feet above the sea, and entering the North Sea a mile northeast of Old Aberdeen (Map: Scotland, F 2). It has a total course of 78 miles. It is noted for its salmon fisheries. Its chief tributary is the Ury.

DO'NA FRANCIS'CA. A German settlement in the State of Santa Catharina, Brazil, founded in 1851 by a German colonization society (Map: Brazil, H 9). It covers an area of about 550 square miles, and had in 1900 a population of nearly 25,000. Chief town, Joinville, with about 3000 inhabitants.

DONAI, dŏn'ī, or **DONNAI**. A river in southeastern French Indo-China, rising in the highlands near the coast in about latitude 12° N. (Map: French Indo-China, E 5). It flows generally southwest, discharging its waters through a delta, which is a continuation of the northern outlet of the Mekong. Saigon, the capital of Cochin-China, is on its banks.

DON'ALDSON, Edward (1816-89). An American naval officer. He was born in Baltimore, entered the navy as midshipman in 1835, and became lieutenant in 1847. In 1862, as commander of the *Scioto*, he took part in the bombardment of forts Jackson and Saint Philip, in Farragut's capture of New Orleans, and was raised to the rank of commander. He also participated in the battle of Mobile Bay. He became a captain in 1866, a commodore in 1871, and a rear-admiral in 1876, when he was retired from the service.

DONALDSON, James (1831 —). A Scottish educator and author. He was born at Aberdeen, was educated at Aberdeen University, New College, London, and Berlin University, and was appointed tutor of Greek at Edinburgh University in 1852. He afterwards became rector of the high schools of Stirling (1854-56) and Edinburgh (1866-81) after having previously been connected with the latter institution as classical master for ten years, and five years later became vice-chancellor and principal of the University of Saint Andrews and principal of the United College of Saint Salvator and Saint Leonard. His publications include the following: *A Modern Greek Grammar for the Use of Classical Students* (1853); *Lyra Græca* (1884); *Critical History of Christian Literature and Doctrine from the Death of the Apostles to the Nicene Council* (1864-66); *The Ante-Nicene Christian Library*, in collaboration with Professor Roberts (24 vols., 1867-72); *Expiatory and Substitutory Sacrifices of the Greeks* (1875).

DONALDSON, James Lowry (1814-85). An American soldier. He was born in Baltimore, Md.; graduated at West Point in 1836, and served with distinction in the Florida and Mexican wars. He was chief quartermaster successively of the Department of the Cumberland and of the Military Division of Tennessee during the Civil War, and at its close was brevetted major-general in the regular army. He retired from active service in 1869 and resigned from the army in 1879. He wrote *Sergeant Atkins* (1871), a tale of the Florida War.

DONALDSON, John William (1811-61). An English classical philologist, born in London. He was educated at the University of London, and afterwards at Trinity College, Cambridge, from which he received the degree of B.A. in 1834. The year following he was elected fellow. His first work was as reviser of Buckham's *The Theatre of the Greeks*, which passed through eight editions, but is now antiquated. In 1839 he published his *New Cratylus*, which is remarkable as being the first attempt, on a large scale, to familiarize Englishmen with the principles of comparative philology, as established by Pott, Bopp, Grimm, and others in Germany. Donaldson in 1841 accepted the post of head-master of the grammar school at Bury Saint Edmunds, having previously taken orders. Notwithstanding his duties as head-master, he found time to prosecute his linguistic studies, embracing Hebrew and Arabic, and many of the languages of modern Europe. In his *Varronianus*, of which the first edition appeared in 1844, he undertook to accomplish for Latin philology what he had done for Greek in the *New Cratylus*. Among his other works of this period are an edition of Pindar, of the *Antigone* of Sophocles (with a verse translation), *Maskil le Sopher* (a treatise on Hebrew grammar), and finally *Jashar* in 1854, a book written in Latin, and published at Berlin, the object of which was, by critical tests, to distinguish the remains of early Hebrew songs imbedded in the Masoretic text of the Old Testament. This book was violently assailed by the religious press but reached a second edition.

He resigned his place at Bury Saint Edmunds, in 1855, and returned to Cambridge, where he gave a course of lectures on Latin synonyms, and occupied himself with teaching. Here he wrote a volume entitled *Christian Orthodoxy*, in answer to the critics of *Jashar*. This also was violently attacked. A smaller volume on classical scholarship followed. He had previously issued a *Greek Grammar* and a *Latin Grammar* for the use of schools. These, during his residence at Cambridge, he recast and enlarged. In 1856 he was appointed one of the classical examiners in the University of London, an honor which he owed chiefly to Mr. Grote, the historian of Greece. In 1858 appeared his *History of the Literature of Ancient Greece*, in three volumes, the first two of which are a translation from the German of K. O. Müller. He was engaged in superintending the compilation of a new *Greek Lexicon*, when his health began to show symptoms of failure. A tour in Germany during the summer of 1860 did not produce any change for the better, and he died in his mother's house in London, February 10, 1861. Consult Garnett in *Dictionary of National Biography*, xv. (1888).

DONALDSON, Thomas Leverton (1795-1885). An English architect and writer, born in London. He was engaged in mercantile pursuits for a time at the Cape of Good Hope, studied architecture, traveled in Italy and Greece for the purpose of architectural and archæological researches, and in 1822 was elected to the Academy of Saint Luke, Rome. He was one of the founders of the Institute of Architects, of which he was in 1864 elected president, and from 1841 to 1864 was emeritus professor of architecture at University College (London). Structures designed by him include University Hall, Gordon Square, London; the Library and Laboratory of University College; and the Scottish Corporation Hall. He published *Pompeii* (2 vols., 1827); *A Collection of the Most Approved Samples of Doorways from Ancient and Modern Buildings in Greece and Italy* (1833); *Handbook of Specifications for Practical Guide to the Architects* (2 vols., 1859), and other works.

DON'ALDSONVILLE. A town and the county-seat of Ascension Parish, La., 64 miles above New Orleans; on the Mississippi River, at the commencement of the Bayou Lafourche, and on the Texas and Pacific Railroad (Map: Louisiana, E 3). It is primarily a commercial centre, with extensive sugar, rice, and cotton interests. Under a charter of 1900, the government is administered by a mayor and a council elected biennially. The town owns and operates the water-works and electric-light plant. Donaldsonville was settled about 1760, and was incorporated in 1806. Population, in 1890, 3121; in 1900, 4105.

DONALITIUS, dŏn'ȧ-lĭsh'ĭ-ŭs, CHRISTIAN (1714-80). A Lithuanian poet. He was born in East Prussia, and, three years after his graduation at Königsberg, was appointed rector at Stallupönen. He died at Tolminkemen, where he had obtained a pastorate in 1743. His poems enjoy high rank among the very meagre products of artistic verse in the Lithuanian language. They include six fables in hexameters. Donalitius's works were published by Schleicher (1865, with Lithuanian-German commentary); and Nesselmann (1869, with a German translation and a glossary).

DO'NAR. Teutonic equivalent of the Scandinavian Thor.

DON'ATEL'LO, or **DONATO,** dô-nä'tô (c.1386-1466). An Italian sculptor of the Florentine School. He was the most important sculptor of the early Renaissance, and, more than any other, may be considered the founder of modern sculpture. He was born at Florence, probably in 1386. His father, Niccolò di Betto Bardi, a wool-comber, was an ardent politician, who passed much of his life in exile. Donato is said to have been brought up in the house of the wealthy and cultured Martelli, but this is unlikely, since the Martelli belonged to the party hostile to his father. Authorities differ as to whether his master in sculpture was Bicci di Lorenzo, Cione, the father of Ghiberti, or Niccolò d'Arezzo, but the question is of little importance in relation to an artist whose work was as original and as revolutionary as Donatello's. He certainly received great inspiration from his friendship with Brunelleschi (q.v.), the architect. In 1403 they went to Rome together, supporting themselves as goldsmiths while they studied and excavated among the ruins. Donatello not only studied the antique statues, but learned the secrets of ancient relief and perspective in sculpture. He was back in Florence by 1405.

Donatello was the most prolific sculptor of the Renaissance, and it will be possible to mention only his principal works. Those executed before 1425 belong to what may be called his formative period, in which he shows strong reminiscences of the Gothic, but with increasing classical and realistic tendencies. Among his early works showing the antique influence is a sandstone relief of the "Annunciation," in the Cavalcanti Chapel, Santa Croce, Florence. It would be hard to conceive of anything more beautiful than the modest, grateful expression of the Virgin's countenance. Of his three marble statues for the exterior of the Church of Or San Michele, "Saint Peter," ordered in 1408 by the Butchers' Guild, shows hesitancy in execution and Gothic reminiscences; "Saint Mark," executed in 1411-12 for the Linen Drapers, is more classic—an admirable figure of noble proportions in an easy position, and set off with graceful drapery; "Saint George," completed in 1416 for the Armorers, now in the Museo Nazionale, is the most attractive work of his early period. The face of the youthful hero is strong and gentle; his bearing expresses determination, but without constraint.

During the same period Donatello was occupied with a number of statues for the Cathedral of Florence. Among these were "John the Evangelist" (1415), the prototype of Michelangelo's "Moses," and a colossal "David" (1416), now in the Museo Nazionale. These works showed classical tendencies, but at the same time he created others of a pronounced realistic character, as, for example, the so-called "Joshua" (1412), in the Cathedral, and especially the figures for the Campanile, the "Jeremiah," and the famous "Zuccone" (Baldhead), erroneously called "David"—an old man of unusual ugliness, though the statue is wonderfully strong and lifelike, and was Donatello's favorite. Both this statue and the painted bust of Niccolò da Uzzano, a realistic portrait, now in the Museo Nazionale, are assigned by some critics to a later period.

Meanwhile Donatello's fame had spread throughout Italy, and he could no longer execute his commissions alone. In 1425 he formed an association with the architect and sculptor Michelozzo, and this date marks the beginning of his second period. Michelozzo furnished the architectural designs, and also assisted in bronze-casting, in which his associate was inexperienced. Their first joint work was the monument to Pope John XXIII. (1425-1426), in the baptistery of Florence. Under a marble canopy, with a relief of the "Madonna and Child," lies the bronze effigy of the Pope, by Donatello. Below is the sarcophagus, carved with two angels bearing the inscription. The beautiful marble base contains three statues, "Faith," "Hope," and "Charity," of which the first is by Michelozzo. Of their other joint works, the monument of Cardinal Brancacci, in Sant' Angelo, Naples, and that of Bartolomeo Arazzi, in the Cathedral of Montepulciano, were chiefly done by Michelozzo (q.v.). The excellent relief of the "Ascension," of the former, is by Donatello. He also executed other bronze works, which Michelozzo cast for him; in 1426 a sepulchral slab for the Bishop of Grosseto, in the Cathedral of Siena, and in 1427 a relief for the font of the baptistery there, representing "Herod Receiving the Head of John the Baptist"—a vivid representation of dramatic action. His association with Michelozzo ceased when the latter accompanied the banished Cosimo de' Medici to Venice in 1433.

In the same year Donatello went to Rome, at the invitation of the sculptor Simone, whom he assisted in the decorations for the coronation of the Emperor Sigismund. The works executed during his stay at Rome show a greater than usual influence of classic art upon him. Chief among them is the Ciborium in the sacristy of Saint Peter, decorated with reliefs of two "Worshiping Angels," and a fine "Burial of Christ." Meanwhile, in 1434, his friend Cosimo de' Medici had returned in triumph to Florence, and Donatello returned about the same time. He was employed in decorating the court of the Medici Palace with eight medallions—copies of antique gems—which were executed by his pupils. About the same time he designed his bronze "David" for Cosimo—a beautiful statue, breathing the spirit of the antique more than any other work of the master—and the first nude statue of the Renaissance, "Judith and Holofernes," now in the Loggia dei Lanzi—a piece of fine realism, although its effect is somewhat marred by Holofernes's legs dangling over the pedestal.

Between 1434 and 1438 he executed the exterior pulpit of the Cathedral of Prato, the reliefs of which, representing "Dancing Angels," are of a lively, decorative effect, and were designed by Donatello, although their imperfect execution points to the work of his pupils. During the same time he completed his reliefs for the organ gallery of the Cathedral of Florence (1440), a counterpiece of the similar subject by Luca della Robbia (q.v.). It is full of energy and dramatic action, the exaggerated motion and sketchy execution being calculated for an elevated position. Ruberto Martelli was also an appreciative patron, as is evinced by a large number of Donatello's works preserved in his house. Among these was a fine coat of arms of the family, a large bronze patera, decorated with Bacchanalian scenes, now in South Kensington Museum, London, and two representations of Donatello's favorite subject, "John the Baptist,"—a bust and a statue. The statue represents him as a youthful ascetic, as does also an older statue in the Museo Nazionale, but the bust, as well as a relief of John the Baptist, in the Museo, and another at Faenza, are more ideal. Donatello also represented him as the ascetic preacher of the desert in a wooden statue in the Church of the Frari, Venice (1451), and in a bronze statue in the Cathedral of Siena (1457). Similar to the latter is the skeleton-like wooden statue of "Magdalen," in the Baptistery of Florence.

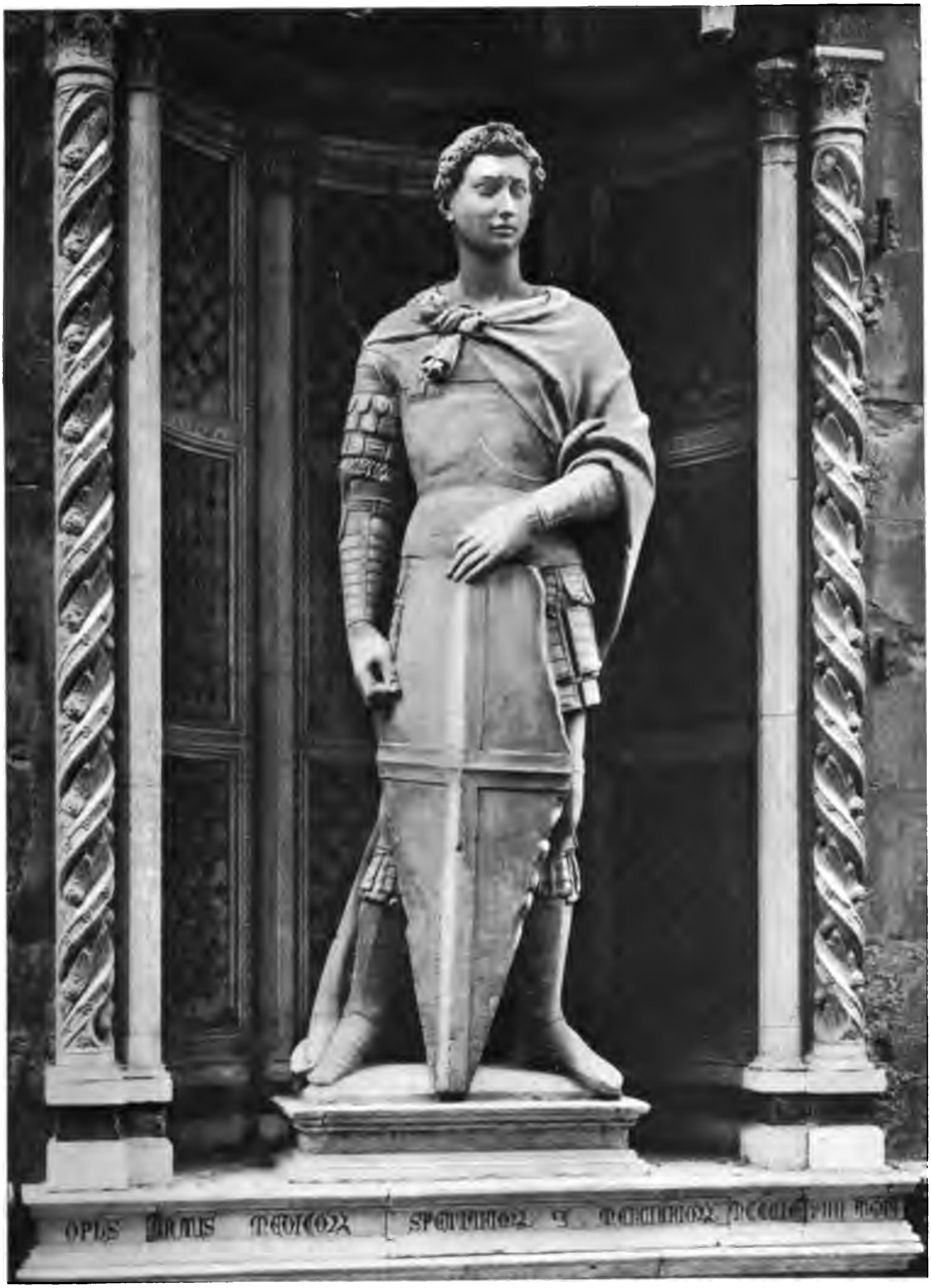
The third period of Donatello's art (1444-66) begins with his call to Padua in 1444, where he was invited to execute a bronze equestrian statue of "Erasmo de' Narni," called "Gattamelata." This work was not finished till 1453. As the first bronze statue since antiquity it was epoch-making in art. The rider is of dignified and noble bearing, and the heavy war-horse is full of life, and no less a portrait than the rider, though the action in walking is untrue to nature. During his stay in Padua he designed a large number of bronze sculptures for the great altar of Sant' Antonio, which are now scattered through the church. Among the subjects represented were statues of the "Four Patron Saints of Padua," and reliefs of a "Pietà," an "Entombment of Christ" (in plaster), "Miracles of Saint Anthony," "Symbols of the Evangelists," and "Angels Singing and Making Music." Although designed by Donatello, these works were executed by his pupils. The "Miracles of Saint Anthony," in particular, show clearness of composition and dramatic action unexcelled in his other works. Notwithstanding the inducements offered him to remain at Padua, Donatello was unhappy away from Florence, and in 1456 he left. After visiting Venice, Ferrara, and other North Italian cities, he returned to Florence in 1457, where he passed the rest of his life, except for a brief stay at Siena. He devoted himself to finishing his work in San Lorenzo, a foundation of the Medici. In 1428 he had executed a fine bronze sepulchral statue for Giovanni, Cosimo's father, there, and before his departure for Padua he had designed the excellent plastic decorations of the Old Sacristy. After his return he designed the sculptures of the two pulpits, which he did not live to complete. They are dramatic in design, but inferior in finish, and, like most of his work of this last period, they show a decline. He died on December 13, 1466, and was buried in San Lorenzo, near his friend Cosimo de' Medici. Vasari's charming anecdotes, confirmed by what we otherwise know, picture him as a modest and lovable character, generous with money and careless of appearance.

Seldom has an artist appeared who was more revolutionary and broke more completely with the past than Donatello. His contemporaries, Ghiberti and Luca della Robbia, represent more the conservative tendencies of the age. Donatello was the great radical. They were the classicists, he the realist—a realist of the highest kind, whose works were true to nature, without being slavish copies. Not that he was deficient in knowledge of the antique, or in the sense of beauty. He deliberately sacrificed beauty to character, which no one could portray better than he. His works also abound in dramatic action. He was an excellent technician, and whether working with bronze or marble, he gained the best effects that his materials would yield. He excelled in the treatment of flesh, and was a consummate master in relief, ranging through its entire scope, and never losing the plastic effect, as was done by Ghiberti. In his last period, however, his compositions became overcrowded and the action is exaggerated. No other artist of the day understood perspective in sculpture as he did; Vasari records interesting anecdotes of the astonishment of the Florentines at the near and distant effects of his statues and reliefs. Donatello left a large and important school, the principal representatives of which were Andrea del Verrocchio, Desiderio da Settignano, Antonio Rossalino, and Bertoldo, teacher of Michelangelo. His influence more than any other dominated the sculpture of Florence throughout the fifteenth century, until the culmination of Italian art in Michelangelo, his artistic descendant. It also was the inspiration of the sculpture of northern Italy, and even of the painting, as is seen in the case of Mantegna, the chief master of Padua, who copied statues of Donatello. Not only was he considered the greatest sculptor of his day, but modern criticism has confirmed this judgment, placing him among the greatest sculptors of all time.

BIBLIOGRAPHY. The chief source of information for the life of Donatello is Vasari's *Lives of the Painters*, edited by Milanesi (Florence, 1878; English translation by Blashfield, New York, 1896), vol. i. The best modern biographies are those of Müntz (Paris, 1885), and Semper (Innsbruck, 1887), probably the best authority. Others are those of Schmarsow (Leipzig, 1886); Pastor (Giessen, 1892); Trombetta (Rome, 1887); Angelini, Carocci, and Melani (Florence, 1887); Reymond (Paris, 1890); Meyer (Bielefeld, 1903). *Vita ed opere di Donatello* (Milan, 1886), contains excellent photographic illustrations. For different phases of Donatello's life and art, see Gloria, *Donatello in Padova* (Padua, 1895); Tschudi, *Donatello e la critica moderna* (Turin, 1887). There is no good English biography of Donatello; see, however, Perkins, *Tuscan Sculptors* (London, 1864); Rosenberg, in Dohme's *Kunst und Künstler Italiens* (Leipzig, 1878); Bode, *Italienische Bildhauer der Renaissance* (Berlin, 1887); *Denkmäler der Renaissanceskulptur Italiens* (1892-1905).

DONATELLO. A young Tuscan nobleman in Hawthorne's *Marble Faun*.

DONATI, dō-nä'tē, GIOVANNI BATTISTA (1826-73). An Italian astronomer, professor in the Royal Institute and director of the observatory


OPERIS ... SPETIARIORUM ...

DONATELLO

STATUE OF "ST. GEORGE," FROM THE SCULPTURE NOW IN THE NATIONAL MUSEUM, FLORENCE

at Florence. He made many valuable contributions to astronomy and meteorology, and in 1858 discovered the comet bearing his name. See Donati's Comet.

DONATION (Lat. *donatio*, gift, from *donare*, to give, from *donum*, Skt. *dāna*, gift, from Lat. *dare*, Gk. *διδόναι didonai*, Skt. *dā*, to give). In strict legal usage, the word donation is confined to the transfer of personal property made without consideration; the word 'gift' being at common law restricted to a particular kind of transfer of real estate—that by which there is created an estate in fee tail—an estate, that is, which is granted to a man and the heirs of his body. The instrument by which such a transfer is made is technically termed a deed of gift. In popular usage, however, the term gift is more commonly employed in the sense of donation, and in the United States this is its usual legal signification also. The general classification of the gifts of personal property is twofold: gifts *inter vivos* (between the living), which go into effect at once and have no reference to future events; and gifts *mortis causa* (because of—that is, in expectation of—death). This last form of gift is usually intended to avoid the necessity of making a will when circumstances render that impossible or difficult. Only personal property can pass in this way; the transfer must be made when the death of the donor appears imminent, there must be delivery of the property, and the gift takes effect only upon the death of the donor. The gift, therefore, is really a conditional one and is *ipso facto* revoked by the recovery of the donor, or may be recalled by him before death actually occurs. A gift *inter vivos*, on the contrary, is absolute, and not revocable.

All kinds of personal property are subject to gift, including even a *chose in action*, that is, property of which the owner has not the actual possession, but the right of possession, and which he may reduce to possession by legal action. Such a right can only be transferred by a duly executed written assignment. The only cases in which a gift of personal property, *inter vivos*, is revocable are where it is prejudicial to the legal rights of creditors, when the donor is legally incapable of making the gift, or when the transaction is vitiated by fraud.

It is a general rule of law that a transfer of personal property will not be presumed to be a donation, or gift; that is to say, unless there is evidence to the contrary, it will be assumed that the transfer of valuable property was made for a valuable consideration. Thus the support of a child by a relative not his parent will render any estate which he may possess liable for a compensation; and it has even been held under special circumstances that a father may maintain a claim for the expense of sustaining his child where the latter possesses a separate estate. A special use of the word donation in this country is in the expression 'donation lands,' which were certain lands set apart by the State of Pennsylvania after the Revolution, in the northwest part of its territory, as a gift to its citizens who had served in the Revolutionary Army. See Conveyance; Delivery; Gift; Personal Property.

The phrase *donatio propter nuptias* (a gift on account of marriage) was used in the civil or Roman law to designate the sum paid by a husband as the offset to the wife's dowry; this was considered partly as a jointure for the wife in case of her survival, partly as security for the return of the wife's dowry to her heirs if she failed to survive her husband. Consult the authorities referred to under the titles Gift; Trust, etc.

DONATION OF CONSTANTINE. (Lat. *donatio Constantini*). A forged document of uncertain date, possibly published about A.D. 754, professing to be the record of a gift bestowed by Constantine the Great upon Pope Sylvester I. By it the Bishop of Rome was granted, besides certain marks and insignia of honor, such as the tiara, the lorum and imperial robes, the temporal sovereignty over Rome and all Italy. The Donation of Constantine, though a very clumsy forgery, was regarded for a long time as genuine, but up to the twelfth century was never made use of to vindicate Papal claims. A translation of the Donation is given in Henderson, *Select Historical Documents of the Middle Ages* (New York, 1892).

DONATION OF PEPIN. The gift of temporal sovereignty over the Exarchate of Ravenna, the Pentapolis, and the territory of Bologna and Ferrara bestowed upon the Pope by Pepin the Short, King of the Franks, in 756. In the preceding year Pope Stephen III. had summoned the Frankish King to aid him against Aistulf, King of the Lombards. Pepin crossed the Alps and defeated Aistulf, but as the latter still continued hostile to the Pope, Pepin invaded Italy a second time in 756, reduced the Lombards to subjection, and took from them twenty-two cities, the keys of which he presented to Saint Peter's. In 774 Charles the Great confirmed the Papacy in possession of the territories granted by Pepin, and enlarged to a considerable extent the boundaries of the earlier grant. The donations of Pepin and Charles the Great laid the foundation of the temporal power of the Pope. Consult Abel, *Jahrbücher des fränkischen Reichs unter Karl dem Grossen* (Leipzig, 1883). See Papal States.

DONATI'S COMET. A comet discovered June 2, 1858, at Florence. When nearest the earth it had an apparent length of 50°, corresponding to the enormous linear size of 45,000,000 miles. The tail was 10,000,000 miles wide. The comet was seen until March, 1859.

DON'ATISTS. The followers of Donatus the Great, a schismatic body of Christians in North Africa, who flourished during the fourth century. In the persecution under Diocletian (A.D. 303), the Christians had been ordered to give up their sacred books. Those who complied with this demand were called *Traditores*, and the question how to deal with them soon became a pressing one in Church discipline. Should they be readmitted to Church fellowship; and, if so, upon what conditions? The main body of the Church, led by Rome, favored a policy of mildness. But there was also a strict party, insisting that the *Traditores* were unworthy, that their presence would corrupt the body ecclesiastic, and that any priestly functions which they might perform would be *ipso facto* null and void. For no priest could convey a grace which he himself had not; and a 'holy' Church must consist only of holy members. This puritan party demanded of all who would enter their fellowship that they should submit to baptism, whether they had previously received that rite or not, although to administer baptism a second time was not the practice of the Church at large.

There was also another cause at work to produce the Donatist schism, viz. the jealousy of Carthage felt by the Numidian clergy, under the lead of their primate, Secundus, Bishop of Tigisis. In 311, after the death of Mensurius, Bishop of Carthage, the Catholic Cæcilian was chosen as his successor. The strict party and the 'confessors' opposed Cæcilian on the ground of his laxity in discipline. They also charged that a *Traditor* had taken part in his ordination, which was thereby invalidated. The Numidian clergy, who were displeased at not having been invited to participate in Cæcilian's election, took sides with this opposition, and these combined forces proceeded to elect a rival Bishop of Carthage in the person of Majorinus. On his death two years later (313), they elected the man from whom their party name is taken, Donatus, called the Great. Thus the North African Church was divided into two hostile camps.

At Constantine's command, synods were held to settle the dispute (Carthage, 311; Rome, 313; Arles, 314), and each time the Donatists lost their case. But their hold upon North Africa continued strong, and at the close of the century they were more numerous there than the Catholics. Signs of internal weakness, however, were not wanting. The Donatists had been reënforced by various malcontents, especially by the fanatical Circumcelliones (q.v.), ascetics of poor morals and worse manners, and this kind of support tended to encourage outbreaks of violence. Rogatus and a few followers withdrew about 370, and the serious defection of the Maximianists came in 393. All this weakened the movement and helped prepare the way for its final collapse. The chief instrument in bringing it to an end was Saint Augustine of Hippo.

Augustine worked out and applied the Catholic position, which had already been pretty clearly formulated. Against the Donatists he taught that the Church on earth is a *corpus permixtum;* the wheat and the tares must grow together until the harvest. The 'holiness' of the Church consists in its possession of sacerdotal power, by which it can transmit divine grace to needy men. At first Augustine sought to win back the schismatics by means of argument. But he later came to believe in the application of force. Accordingly he approved the Imperial policy of coercion, adopted by Honorius in 405. See AUGUSTINE, SAINT.

In 411, a synod was held in Carthage, at which the whole subject of Donatism was debated anew, 286 Catholic bishops opposing 279 Donatists. The verdict (prearranged) was on the side of Catholicism. The Donatists were deprived of civil rights, and a little later they were debarred from holding religious meetings upon pain of death. From this time Donatism rapidly lost its power. Although adherents of the sect are to be found for two centuries longer, their number and their public influence steadily decreases. The Saracen invasion of the seventh century put an end to the power of Donatism and Catholicism alike in North Africa.

Consult: Augustine, anti-Donatist writings, in vol. iv. of *The Nicene Fathers*, 1st series, ed. by Schaff (Buffalo, 1886); also his 93d *Epistle;* Optatus of Mileve, *De Schismate Donatistarum*, ed. by Ziwsa, in *Corp. Script. Eccles. Lat.*, xxvi. (Vienna, 1893); Völter, *Der Ursprung des Donatismus* (Freiburg, 1883); Harnack, *History of Dogma*, Engl. trans. (London, 1898).

DONATO DI BETTO BARDI, dō-nä′tō dē bĕt′tō bär′dē. See DONATELLO.

DONATUS. See DONATISTS.

DONA′TUS, ÆLIUS. A well-known grammarian and commentator, who taught grammar and rhetoric at Rome about A.D. 355, and was the instructor of Saint Jerome. He wrote treatises, *De Litteris, Syllabis, Pedibus et Tonis; De Octo Partibus Orationis; De Barbarismo et Solœcismo*, etc., which form together a pretty complete course of Latin grammar, and in the Middle Ages were the only text-books used in the schools, so that *Donat* came, in the west of Europe, to be synonymous with grammar, or with the elements of any science. *The Donat into Religion* is the title of a book by an English bishop, and there was an old French proverb, *Les diables estoient encore à leur Donat* (The devils were still in their grammar). The Latin grammar of Donatus has formed the groundwork of the elementary treatises on that subject to the present day. His was one of the first books in which the art of printing by means of letters cut on wooden blocks was tried, and copies of these Donatuses are reckoned among the greatest of bibliographical curiosities. The best edition of Donatus is in volume iv. of Keil's *Grammatici Latini* (Leipzig, 1864). The author also wrote a commentary on Terence, of which we possess only a part extending to five comedies, to be found in the edition of Terence by Klotz (2 vols., Leipzig, 1838); and an important commentary on the *Æneid* and *Georgics* of Vergil, which exists to-day only in numerous quotations.

From this Donatus we must distinguish a later grammarian, TIBERIUS CLAUDIUS DONATUS, also of the fourth century A.D., author of a commentary, of little importance, on the *Æneid.*

DONAUWÖRTH, dō′nou-vĕrt (Ger., neck of land on the Danube). A town of Bavaria, situated at the confluence of the Wörnitz and the Danube, about 25 miles north-northwest of Augsburg (Map: Germany, D 4). It is well built, in the form of an amphitheatre, around the side of a hill, and has the most important monthly live-stock market in Bavaria. Donauwörth rose to the rank of a free imperial city in the fourteenth century. It was deprived of its liberties in 1607 in consequence of the hindrance by its Protestant inhabitants of a Catholic procession, and incorporated with Bavaria. This high-handed dealing on the part of the Catholic powers in Germany was one of the episodes that led up to the Thirty Years' War. Here Marlborough gained a victory over the Bavarians in 1704, and the French over the Austrians in 1805. Population, in 1890, 3733; in 1900, 4400.

DONAWITZ, dō′nȧ-vĭts. A town of Styria, Austria, two miles north of Leoben. Its iron and smelting works are important, employing about 2000 men. There are also productive coal-mines. The old pilgrims' church of Freienstein occupies an adjacent eminence. Population, in 1890 (commune), 8000; in 1900, 13,093.

DON BENITO, dōn bȧ-nā′tō. A town in the Province of Badajoz, Spain, 57 miles east of the city of Badajoz; near the left bank of the Guadiana, on the Ciudad Real-Badajoz Railway (Map: Spain, C 3). It is picturesquely situated and generally well built, and possesses a fine square, the Plaza de la Constitución, with a central promenade. The town is the centre of a district noted for its melons and which produces also grain, wine, oil, and vegetables. It has manufactures of textiles, liquids, flour, and soap. Don Benito is a comparatively modern town, having been founded in 1477. Population, in 1901, 16,656.

DON CAR'LOS. The title of several dramas and operas based on the life of the son of Philip II. of Spain: (1) A tragedy by Otway, performed in 1676, called by Gosse the best English tragedy in rhyme. Its plot was borrowed from the historical romance by the Abbé de Saint Réal. (2) A drama by Schiller, completed in 1787. (3) An opera by Verdi, produced in Paris, March 11, 1867.

DON CARLOS. See Carlos.

DONCASTER, dŏṉ'kas-tẽr (*Don* + *caster*, AS. *ceaster*, from Lat. *castrum*, camp). A municipal borough and market town in the West Riding of Yorkshire, England, on the right bank of the Don, 32 miles south of York (Map: England, E 3). The country around is flat but beautiful. Fine old elms line the broad and level road from the south. Doncaster is very clean and well built, and contains a handsome Gothic Church of Saint George, built by Sir G. G. Scott in 1858; a fine market hall; a guildhall and corn exchange. The municipality owns its gas and water supply and the race-course, all of which constitute an important source of revenue. Markets, slaughter-houses, a public library, and an art school are also maintained by the town. It has manufactures of iron, brass, sacking, linen, and agricultural machines. Its corn market is one of the largest in the kingdom. The Great Northern Railway has large machine shops here. Population, in 1891, 25,933; in 1901, 28,924. It has long been famous for its annual races, begun in 1703, and held in the second week of September. On an eminence five miles west-southwest are the ruins of Conisborough Castle, a Norman-Saxon round tower, 37 feet in diameter and 86 feet high, with walls 15 feet thick, strengthened by square buttresses. The door is reached by an external flight of 37 steps. Doncaster was the Danum of the Romans and the Dona Ceaster of the Saxons, and suffered severely during the Danish invasion. It received municipal rights toward the end of the twelfth century.

DONCELLA, or **DONZELLA,** dôn-sā'lyȧ *or* dôn-zĕl'lȧ (Sp., It., girl). The name in the West Indies of several small, gaudy, and graceful fishes, as the snake-like carnivorous Ophidiidæ, of which one species (*Ophidion marginatum*), also called 'sand-cusk,' extends northward to New York; or of the labroid fishes of the genus Platyglossus, especially *Platyglossus radiatus*, also called 'bluefish' and 'pudding-wife.'

DON CÉSAR DE BAZAN, dôɴ sȧ'zär' de bȧ'-zäɴ'. The title of a French comedy by Dumanoir and Dennery (1844), suggested by the humorous underplot in Hugo's *Ruy Blas*. The hero exchanges the title and debts of a Count of Garofa for the rags and freedom of a Zafari. He is also the subject of an English play, and of a comic opera by Massenet (1872).

DON COSSACKS, Province of the. A region in southern Russia, bounded by the governments of Voronezh and Saratov on the north, Saratov and Astrakhan on the east, Stavropol and Kuban on the south, the Sea of Azov and the governments of Ekaterinoslav, Kharkov, and Voronezh on the west (Map: Russia, F 5). Its area is about 63,532 square miles. The surface is generally level, the portion lying west of the Don being slightly elevated. The whole territory belongs to the basin of the Don. The soil is for a large part fertile.

Agriculture is the leading industry. Rye, wheat, oats, and barley are the chief cereals grown. The cultivation of the vine is carried on extensively, the output of wine being exported all over Russia. The raising of live stock is also an important industry, and fishing, especially for herring, gives occupation to a considerable portion of the inhabitants. The territory has some of the richest coal deposits in Russia, known as the Donetz Coal Basin. Coal has been mined in the territory since the end of the eighteenth century, and the present annual output exceeds 12,500,000 tons, a large portion of which is anthracite. Iron, lead, and salt are also mined. The manufacturing industry is but slightly developed. Tobacco and cigarette factories and flour-mills are practically the only establishments. The territory is administered by an ataman of the Cossacks, and is divided for administrative purposes into nine districts. The capital is Novo-Tcherkask; the chief commercial centre is Rostov. The population in 1897 was 2,564,238, of whom Cossacks (q.v.) and other Russians composed nearly 98 per cent., the rest consisting chiefly of Kalmucks.

DON'DERBERG, or **DUNDERBERG** (Dutch, Thunder-Mount). The name of a mountain on the Hudson River, a short distance below West Point, the subject of a local legend.

DON'DERS, Franz Cornelis (1818-89). A Dutch physiologist and ophthalmologist, born at Tilburg, North Brabant. He was educated at the University of Utrecht, in 1847 was appointed lecturer, and in 1863 professor at that institution. He established a modern physiological laboratory at the university and erected the *Nederlandsch Gasthuis voor Ooglijders*. His researches were chiefly devoted to the physiology of optics and were considered very valuable. The introduction of prismatic and cylindrical glasses is due to him. Among his principal publications may be mentioned: *Anomalies of Accommodation and Refraction of the Eye,* a subject to which he gave especial attention (published in English by the Sydenham Society); *Die Lehre von den Augenbewegungen* (in German, 1847), and the so-called *Law of Donders: De leer der stofwisseling als bron der eigenwarmte* (1845).

DONDO, dôɴ'dô. A town in the Portuguese colony of Angola, West Africa, on the Coanza River (Map: Congo Free State, B 4). The unhealthful climate makes it an undesirable place for Europeans, but the town is important on account of its caravan trade and its proximity to the Loanda Railway. Dondo is also the centre of the coffee trade. It is connected by steamers with Loanda. Population, about 3000.

DONDÚKOFF - KORSSÁKOFF, dôn'dụ-kôf' kôr-sȧ'kôf', Alexander Michailovitch, Prince (1822-93). A Russian statesman. He quickly attained the rank of general in the Russian Army, and in 1878 was appointed Governor of Bulgaria. After the conclusion of the arrangement effected by the Berlin Congress, he remained in Bulgaria, whose first Parliament he opened at Tirnova in 1879. He was chosen Prince of Bulgaria, but was instructed by the Czar to refuse the dignity and to secure the election of Prince Alexander of Battenberg. From 1882 to 1890 he was commander-in chief of the Russian forces in Caucasia, and administrator of the civil government in that region.

DONEAU, dō'nō′, Hugues, Latin name Donellus (1527-91). A French jurist. He was born at Chalons-sur-Saône, and was educated at Toulouse and Bourges. After having been for twenty years professor of Roman law at Bourges, he was compelled to flee to Geneva at the time of the massacre of Saint Bartholomew's Day, and subsequently became professor at Heidelberg (1573), Leyden (1579), and Altdorf (1588). The civil jurisprudence of modern times has availed itself of his systematic methods. His celebrated *Commentarii de Jure Civili* (16 vols., 6th ed. 1822-34) is a faithful compilation of the civil law and legal procedure of Rome.

DONEGAL, dŏn'ė-gäl′ (Ir. *Dun-na-n Gal*, Fort of the Stranger, in allusion to the Danish invaders). A maritime county of Ireland, in Ulster Province, bounded north and west by the Atlantic (Map: Ireland, C 2). It has an area of 1870 square miles, and an extensive and much indented coast-line, off which lie numerous islands. The surface is, for the most part, either mountainous, moory, or boggy, interspersed with many small lakes and rivers. The inhabitants are mainly engaged in agriculture. Linen and woolen manufactures are carried on, and the female population is largely engaged in the working of muslin. Many of the inhabitants on the coast are occupied in the fisheries. Capital, Lifford. The population since 1841 shows a continual decrease, having been at that date 296,500; in 1851, 255,200; in 1891, 185,635; in 1901, 173,722.

DONEGAL. A seaport in the south of Donegal County, Ireland, at the mouth of the Eske, on a shallow creek of Donegal Bay, 11 miles north-northeast of Ballyshannon (Map: Ireland, C 2). It lies in a rich alluvial tract, surrounded on three sides by hills, behind which rise lofty, picturesque mountains. Near the town are Donegal Castle, formerly belonging to the O'Donnels of Tyrconnel, and the ruins of a Franciscan monastery, founded in 1474 by Hugh O'Donnel, in which was written the collection of early Irish chronicles known as the *Annals of the Four Masters*. Population, about 1500.

DONEL′LUS. See Doneau, Hugues.

DON′ELSON, Andrew Jackson (1800-71). An American politician and diplomat. He was born near Nashville, Tenn., and was educated at Nashville College and at West Point Military Academy. Commissioned a lieutenant of engineers, he accompanied, in 1820, his uncle, Gen. Andrew Jackson, as his aide-de-camp, to Florida. In 1822 he resigned his commission, and after a year's study of law at Transylvania University at Lexington, Ky., he was admitted to the bar. He actively participated in the campaigns of Jackson for the Presidency in 1824 and 1828, and after the latter's inauguration in 1829 became his private secretary at Washington, continuing to act in that capacity throughout his two administrations. From 1836 to 1844 he lived in retirement, and in the latter year, by appointment of President Tyler, he filled a diplomatic mission to Texas to arrange a new treaty of annexation, the first having been rejected by the Senate. His mission terminated successfully with the admission of Texas to the Union in 1845. In 1846 he was appointed by President Polk Minister Plenipotentiary to Prussia, and in 1848 was accredited to the Federal Government of Germany. Returning to the United States toward the close of 1849, he took an active part in the discussion growing out of the acquisition of territory after the Mexican War. He attended the Southern Convention at Nashville in May, 1850, where he was one of the ablest and most earnest champions of the Union. He was a strong supporter of Clay in the compromise of 1850, and in the year following became editor of the *Washington Union*, an organ representing that branch of the Democratic Party that believed as he did. In 1853, however, he became entirely alienated from the Democratic Party, and in 1856, when ex-President Millard Fillmore was nominated for President by the American Party, Donelson was made the nominee for Vice-President. After his defeat he retired to private life, and although always a strong Union man, took no part in the events preceding the Civil War, throughout which he lived quietly on his estates in Tennessee.

DON′ELSON, Fort. See Fort Henry and Fort Donelson.

DONETZ, dô-nyĕts′. A tributary of the Don, rising in the Russian Government of Kursk (Map: Russia, E 5). It flows through the Province of the Don Cossacks, and joins the Don at Konstantinovskaya. Its total length is over 670 miles, and it is navigable to Izum, in the Government of Kharkov. Its banks are thickly wooded, and there are coal deposits in its basin. The commercial importance of the river is as yet insignificant, owing to the undeveloped state of the country through which it flows.

DON′GAN, Thomas, Earl of Limerick (1634-1715). A Colonial Governor of New York. He was born at Castletown, County Kildare, Ireland. He served in the English and French armies with the rank of colonel, and in 1678 was appointed Lieutenant-Governor of Tangier by Charles II. The Duke of York appointed him Governor of the Province of New York in 1682. Being a Roman Catholic, he was at first looked upon with suspicion by the colonists, but he showed himself champion of their interests and managed the relations between the English, French, and Indians with great sagacity. He granted a charter to the city of New York, and another to the city of Albany, which still remains the basis of its municipal rights. Refusing to carry out the instructions of King James II., to introduce French priests among the Five Nations, on the ground that the measure was dangerous to English power on the Continent, he was obliged to resign in 1688, but did not return to England until 1691. He succeeded to the title of Earl of Limerick by the death of his brother in 1698.

DON GIOVANNI, dôn jô-vän'nê. The title of an opera by Mozart, produced with unexampled success at Prague in 1787. It is the composer's masterpiece. See DON JUAN.

DONGOLA, dŏn̦'gô-lȧ. A province of Egyptian Sudan, situated between latitudes 18° 30′ and 19° 40′ N. It is generally level and fertile, and produces large quantities of wheat and dates for export. Its inhabitants, about 56,000 in number, are a mixed race of Turkish, Arabic, and Mameluke descent, and profess Islamism. Dongola was formerly a prominent province of Nubia. It was taken in 1812 by the Mamelukes, who had been expelled from Egypt, but they were soon compelled to abandon their new place of refuge after the expedition of Ibrahim Pasha, in 1821. During the Mahdist revolt the province fell into the hands of the dervishes, from whom it was regained by the Anglo-Egyptian forces under Kitchener in 1896. The present capital of the province is El-Ordeh (q.v.), or New Dongola, on the west bank of the Nile. Old Dongola, situated on the east bank of the Nile, about 60 miles above El-Ordeh, which was an important place in antiquity, is now a mere village.

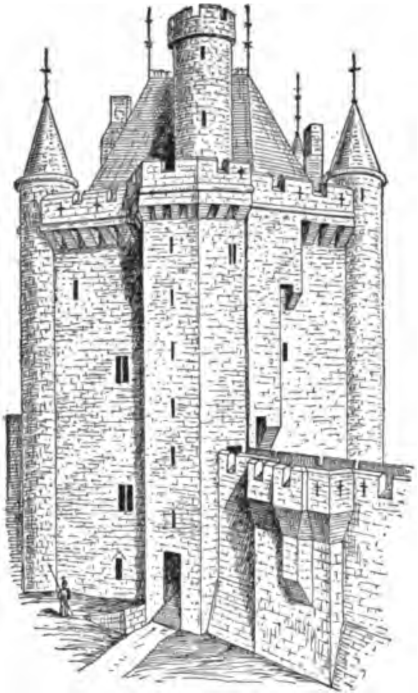
DONGOLA (from *Dongola* in Egyptian Sudan) **KID**. Sheepskin or goatskin so finished as to resemble French kid. It was first put on the market in 1880 by James Kent, of Gloversville, N. Y., and created a revolution in certain branches of the leather industry.

DONIOL, dô'nyôl', JEAN HENRI ANTOINE (1818—). A French publicist and historian, born at Riom (Puy-de-Dôme). He studied at the University of Paris, and from 1848 to 1882 was a member of the departmental administration. In 1882 he was appointed director of the national printing establishment. His publications include the following scholarly works: *Histoire des classes rurales en France* (1857); *La révolution française et la féodalité* (1874); and *Histoire de la participation de la France à l'établissement des Etats-Unis d'Amérique* (5 vols. and sup., 1886-1900), the last being a valuable and monumental work, in which numerous important documents were first placed before the public, and for which he is best known, especially in America.

DONIS CONDITIONALIBUS, dō'nĭs kŏn-dĭsh'ĭ-ô-năl'ĭ-bŭs, STATUTE DE (Lat., concerning conditional gifts). The usual legal title of the famous statute of Westminster II. (13 Edward I., c. 1), passed in 1285, which created and stereotyped the form of estate which is known as a fee tail. Prior to its enactment such estates were known as conditional fees or gifts, whence the name of the statute. Thus, a gift of lands to a man and the heirs of his body was construed to be a fee simple, descendible to his heirs in general, in case he complied with the condition that he have lawful issue. He could then, by alienating the lands to a stranger in fee simple, defeat the expectations of his issue, just as a man may now, by alienation of an estate of inheritance, defeat the expectations of his heirs. By the same act, the right or expectation of any remainderman to whom the estate was to go on failure of issue was also cut off. This disposition of the conditional fee contrary to the expressed intention of the one who created it (known as the *donor*) was regarded as a grave abuse, and it was to remedy this that the statute *de donis* was passed. It provided that for the future the will of the donor of conditional gifts should be observed "so that they to whom the land was given under such condition shall have no power to aliene the land so given, but that it shall remain unto the issue of them to whom it was given after their death, or shall revert unto the giver or his heirs if issue fail," etc. This limitation upon the power of the donor of a conditional gift had the practical effect of restricting the descent thereof to the heirs of his body, and so created the fee-tail estate as it has come down to us. For the permanent effects of the statute, see CONDITION; FEE TAIL.

DONIZETTI, dô'nê-zĕt'tê, GAETANO (1797-1848). An Italian operatic composer, born at Bergamo. He studied at the local conservatory under Simon Mayr, Salari, and Gonzalez, and later at Bologna. In 1819 his first opera, *Enrico di Borgogna*, won success at Venice, and he thereafter wrote about three operas a year. He mastered so perfectly the style of Rossini, then reigning supreme, as to rival the 'Swan of Pesaro' himself. Then Bellini appeared and threatened to eclipse him. Donizetti took particular pains with his *Anna Bolena* (1830), which was presented at Milan on the same night as Bellini's *Sonnambula*. This marked the beginning of more serious work on his part. *L'Elisir d'Amore* (1832), a comic opera, and the tragic *Lucrezia Borgia* (1834) and *Lucia di Lammermoor* (1835) were his next particular successes. Upon the death of Bellini he remained the undisputed master of the Italian stage, and was eagerly acclaimed all over Europe. He settled in Paris (1835) and began to write for the French stage. *La fille du régiment* (1840) had enormous success at the Opéra Comique; *Les martyrs* (forbidden by the censor in Italy as *Poliuto*) and *La favorita* were both given in Paris the same year, and *Don Pasquale*, a comic opera, in 1843. In 1842 *Linda di Chamounix* created a furore in Vienna, and the Emperor showered honors upon him. Amid this unexampled series of successes and honors his mind gave way, and the last four years of his life he was insane. A great festival was held in Donizetti's honor at Bergamo on the one hundredth anniversary of his birth, and a monument was erected there in 1855. The facility of his pen was astounding; the fourth act of *La favorita* was composed in a tavern while he was waiting for a friend, and both music and liberetto of *Il Campanello di Notte* were written within nine days. With this facility he combined an endless flow of melody and a genuine dramatic talent, applied only too rarely. The fourth act of *La favorita* and the famous sextet of *Lucia di Lammermoor* (his masterpiece) are splendid specimens of musico-dramatic writing combined with melodic beauty. In his comic operas, as e.g. *Don Pasquale*, *La fille du régiment*, he exhibits an excellent comic vein, and the music is light and sparkling. In all he wrote about seventy operas. Consult: Cicconetti, *Vita di G. Donizetti* (Rome, 1864); Ferris, *Great Musical Composers* (New York, 1887).

DONJON (OF. *donjon*, *dongon*, *dongeon*, Fr. *donjon*, Prov. *donjon*, *dompnhon*, from ML. *domnio*, dungeon, from *dominio*, Lat. *dominium*, lordship, from *dominus*, lord), or DUNGEON. The principal tower, or keep, of a castle or fortress. It was so called because, from its position, it dominated or commanded the other parts of the fortress. From the circumstance that the lower or underground story of the donjon was used as a prison has come the modern meaning of the word. See CASTLE; KEEP.



A DONJON.

DON JU'AN, *Sp. pron.* dŏn hwän (Sp., Sir John). A legendary figure, and one of the most widely handled in all modern poetry. The ideal of the Don Juan legend is presented in the life of a profligate, who gives himself up so entirely to the gratification of sense that he acknowledges no higher consideration, and proceeds to murder the man who stands between him and his wish, fancying that in so doing he has annihilated his very existence. Partly in wanton daring, partly to allay all uneasy misgiving, he then challenges that spirit in which he disbelieves, to demonstrate to him its existence in the only way he holds valid—namely, through the senses. When this actually happens, when the spirit proves its existence and power, and compels him to acknowledge its supremacy and the worthlessness of a merely sensuous existence, he is crushed and sinks into hell. The genuine legend of Don Juan was first put into form by Gabriel Tellez (Tirso de Molina), in *El Burlador de Sevilla y Convidado de Piedra.* In it the hero is described as a member of a celebrated Sevillan family, Tenorio, while the action of the piece turns mainly upon his betrayal of his friend, the Marquis de la Mota, and his attempt to seduce the latter's betrothed. Being opposed by her father, he kills him, forces his way into the family tomb of the murdered man, causes a feast to be prepared and invites the statue which has been erected over his victim to be his guest. The stone guest appears at table as invited, compels Don Juan to follow him, and, the measure of his sins being full, delivers him over to hell. This drama was worked over in Italy by Cicognini and by Giliberto, not later than 1650. It became the basis of Dorimond's *Festin de pierre* (1658), of *Le fils criminel* of De Villiers (1660), of the *Don Juan* of Molière (1665), and of still other versions by Rosimond and Thomas Corneille. In England it was utilized by Shadwell in *The Libertine* (1676). In the seventeenth century it served repeatedly in Italy as a theme for opera, being first used by Gluck, and later handled successively by Reghini, Cimarosa, Albertini, Gazzaniga, and other composers. All of these were eclipsed by Mozart's immortal work, *Don Giovanni.* Among modern uses of the theme are: Prosper Mérimée, *Les âmes du purgatoire;* Dumas's drama, *Don Juan de Marana*; Byron, D'Aurévilly, Balzac, and Flaubert's posthumous fragment; also Bernard Shaw's fantastic episode in *Man and Superman.* Consult: Picatoste, *Don Juan Tenorio* (Madrid, 1883); Engel, *Die Don Juan-Sage* (Dresden, 1887).

DONKEY (from *dun*, with reference to its color + double diminutive *key*). The domestic ass. See ASS; and Colored Plate of HORSES.

DONNA DEL LAGO, LA. An opera by Rossini (q.v.), produced at Naples in 1819.

DONNAY, dō'nā', MAURICE (1860—). A French dramatist, born in Paris. He made his first appearance on the stage in 1891 with *Phryné*, a Greek shadow play, followed in 1892 by an adaptation of the *Lysistrata* of Aristophanes. With *Pension de famille* (1894) begins a series of contemporary studies, including *Amants* (1895), *La douloureuse* (1897), *Le torrent* (1899), *La bascule* (1901), *L'autre danger* (1902), *Le retour de Jerusalem* (1903), *L'escalade* (1904), *Paraître* (1906).

DONNDORF, dŏn'dŏrf, KARL ADOLF (1835—). A German sculptor, born at Weimar. In 1877 he became a professor in the Art School at Stuttgart. Among his works are statues of Savonarola, for the Luther Memorial at Worms; a bronze statue of J. S. Bach at Eisenach; the Freiligrath Memorial at Cannstatt, and portrait-busts of Theodor Vischer, von Moltke, Gerok, and Bismarck.

DONNE, dŏn, JOHN (1573-1631). An English poet and divine. He was born in London, where his father, John Donne, who was Welsh by descent, was a prosperous ironmonger. His mother was a daughter of John Heywood, the epigrammatist. He was brought up a Roman Catholic. In 1584 he was admitted at Hart Hall, Oxford, but was transferred to Cambridge; and in 1592 he was entered at Lincoln's Inn. A little later he turned Protestant. In 1596 he served under Essex in the famous expedition to Cadiz, and on his return was appointed secretary to Sir Thomas Egerton, Keeper of the Great Seal. During the next few years he wrote many poems, some of which circulated in MSS., but none were published. In December, 1600, he secretly married Anne, then only seventeen years old, the daughter of Sir George More, brother of the Lord Keeper's wife. In consequence of this act, he was dismissed from office, and was even committed to the Fleet, but he soon obtained his release. Though James was friendly toward him, the King gave him no post at Court. Donne continued to write verse, sending the MSS. of his *Divine Poems* to the mother of George Herbert in 1607. In 1610, he wrote for the King the *Pseudo-Martyr*, an argument against the attitude of the Catholics toward the oath of allegiance. This was his first publication. The next year he published a beautiful elegy on the death of Elizabeth, daughter of Sir Robert Drury, who was Donne's patron. This poem was followed in 1612 by a philosophical poem, called *The Progress of the Soul.* Donne soon began to look toward the Church for a career. In 1615 he was ordained in London, and the University of Cambridge made him a D.D. The next year he was presented to the livings of Keyston in Huntingdonshire and of Sevenoaks in Kent. He never resided in either parish, but he held Sevenoaks till his death. The same year he was appointed divinity reader of Lincoln's Inn, and in 1621 he was elected dean of Saint Paul's. He died March 31, 1631, and was buried in Saint Paul's. As a preacher, Donne at once attained eminence. His verse consists of satires, elegies, religious poems, epistles, and epigrams. Donne was among the first of a series of poets of the seventeenth century, who, under the infelicitous name of 'the metaphysical poets,' fill a conspicuous place in English literary history. The directness of thought, the naturalness of description, the rich abundance of genuine poetical feeling and imagery, now began to give way to cold and forced conceits, and elaborate exercises of the intellect. Yet it is generally acknowledged, especially in the case of Donne, that, amid these subtleties, there is real poetry, and that of a high order. Especially beautiful are *The Storm, The Calm, The Blossom, The Primrose,* and *Upon Parting with His Mistress.* Donne's influence has been very great, for not only did he found a school of poetry which flourished till the advent of Dryden; but his intensity and obscurity passed into Browning. Donne published little, but from his voluminous MSS. a collection of the poems was published in 1633; and eighty sermons in 1640, to which was prefixed a charming Life by Isaak Walton. For his poems, consult the editions by Grosart, in *Fuller's Worthies Library* (London, 1872); and by Chambers, with introd. by Saintsbury (ib., 1896); for sermons: Alford, *The Works of John Donne* (London, 1839); for his life: Jessop (London, 1897); and Gosse, *Life and Letters of John Donne* (London, 1899).

DON'NELLY, Ignatius (1831-1901). An American journalist, politician, and essayist of eccentric ingenuity. He was born in Philadelphia, studied law there, and was admitted to the bar in 1852, went to Minnesota in 1856, and was elected Lieutenant-Governor of that State in 1859 and 1861. From 1863 to 1869 he was a Representative in Congress. In 1873-78 he edited at Saint Louis *The Antimonopolist,* a weekly newspaper in support of the Greenback policy, and in 1876 was president of the Antimonopoly convention that nominated Peter Cooper for the Presidency of the United States. For many years he served as a Democrat in both Houses of the Legislature of Minnesota. He was nominated for the Vice-Presidency of the United States in 1898 by the People's Party, and in 1900 by the 'Middle-of-the-Road' wing of that party. Latterly he edited at Minneapolis a journal called *The Representative.* His *Atlantis* (1882) endeavored to prove that the island of that name once really existed, and was the original seat of civilization. *Ragnarök* (1883) undertook to explain the geologic formations of the drift age by cometary contact. *The Great Cryptogram* (1887) sought, by the application of an elaborate word-cipher to the First Folio, to furnish convincing evidence of the Baconian authorship of Shakespeare. He wrote also *Cipher in the Shakespeare Plays* (1900).

DON'NER, Johann Jakob Christian (1799-1875). A German translator of the classic poets. He was born at Krefeld, and, after studying at Tübingen, was professor at Stuttgart from 1843 to 1852, when he resigned his professorship to devote himself entirely to literary labors. He rendered the works of the Greek and Roman poets into German, in their original metres. Among his translations are those of the satires of Juvenal (1821); Persius (1822); and the tragedies of Sophocles (1838-39, 11th ed. 1889). This work, his masterpiece, is still the basis for almost all the metrical translations of Sophocles. It was followed by translations of Euripides (1841-53); Æschylus (1854); the *Iliad* (1855-57); the *Odyssey* (1858-59); Pindar (1860); and Aristophanes (1861). His translations of Terence (1864), Plautus (1864-65), and Quintus Smyrnæus (1866) were less successful.

DONNER, Raphael (1692-1741). An Austrian sculptor, born at Esslingen. He received his artistic training chiefly at the Vienna Academy, was appointed to a post in the Imperial service in 1724, and in 1729 director of building to Prince Eszterházy. As a sculptor he endeavored to substitute for the over-elaborate and confused style of Bernini, then dominant in plastic art, a simpler method, combining the rococo and the antique. His works include two bas-reliefs in marble for Saint Stephen's Cathedral at Vienna, a fountain in lead for the court of the Old Town Hall, Vienna, and another for the New Market in that city.

DON'NITHORNE, Arthur. An aristocratic weakling in George Eliot's *Adam Bede,* the seducer of Hetty.

DON'NYBROOK (Ir., Church of Saint Broc). A village in Dublin County, Ireland, and a southeastern suburb of Dublin (Map: Ireland, E 3). Population, about 2000. It was formerly famous for its fair, instituted under King John, and held annually in August. Originally of two weeks' duration, in later times the fair lasted only a week. It was noted for its debauchery and fighting, and in 1855 was finally abolished. A Donnybrook fair has become a popular term for any scene of uproar. Consult B. Gray (pen-name of R. B. Coffin), *Donnybrook Fair* (New York, 1865).

DONOSO, dô-nŏ'sô, Justo (1800-68). A Chilean bishop, born at Santiago. He became rector of the Seminario Conciliar in that city, and was subsequently appointed lecturer on theology and secretary of the theological faculty at the university, and judge of the ecclesiastical court. He was one of the founders of the *Revista Católica,* which was published for more than thirty years, and was distinguished for his versatility as a lecturer, author, and minister. He afterwards became Bishop of Ancud (1844-55) and Serena (1855-68). His publication entitled *Instituciones de derecho canonico americano* (1863) is regarded as a standard work.

DONOSO-CORTÉS, dô-nŏ'sô kôr-tās', Juan Francisco Maria de la Salud, Marquis de Valdegamas (1809-53). A Spanish author and diplomat, born at El Valle (Estremadura). He was educated for the bar at Salamanca, entered public life, and took the part of Isabella against Don Carlos in the Revolution of 1832. He was secretary of the Council under Mendizabal, and followed the Queen mother in her flight to France (1840). When she returned, he was made secretary (1844), had charge of the education of the young Queen, and was finally sent as Ambassador to Berlin (1848). About this time he astonished his countrymen by proclaiming the absolute supremacy of the Catholic Church in his work, *Ensayo sobre el catolicismo, el liberalismo y el socialismo* (1851). He died while Ambassador to Paris, his last official post. His works were published, with a biography by Tejado (1854-55).

DON PASQUALE, päs-kwä'lå. A comic opera by Donizetti, produced at Paris, January 3, 1843. The last of his successful works, preceding the failures of *Dom Sebastian* and *Catarina Cornaro,* it contains brilliant examples of Italian concerted music, combined with much humorous delineation. It was revived with great success at the Stuttgart Court Theatre in 1898.

DON QUIXOTE, dŏn kwĭks'ŏt, *Span. pron.* dôn kê-Hŏŏ'tå. See Cervantes.

DON SALTE'RO'S COFFEE-HOUSE. An eating-house and museum, established by John Salter, a barber, in 1695, in Cheyne Walk, Chelsea, London, and demolished in 1866. It is frequently mentioned by Swift, Steele, and other writers of that period.

DON SANCHE D'ARAGON, dôN säNsh då-rå-gôN'. A comedy by Corneille, derived from a Spanish play, *El palacio confuso*, and produced in 1650. Don Carlos, a fisherman, proves, in its dénouement, to be the heir to the throne of Aragon.

DO'NUS, or **DOM'NUS** (?-678). Pope from 676 to 678. He was a patron of architecture and the arts, and made a rebellious Archbishop of Ravenna acknowledge the claims of Rome. A Donus II. is sometimes placed on the list of popes for the year 974. This is an error, the word *domnus* in the expression *domnus papa,* used as a shorter form of *dominus,* having been wrongly taken as a proper name.

DOO, George Thomas (1800-86). An English engraver. He was born in Surrey, January 6, 1800. His "Duke of York," after Sir Thomas Lawrence, engraved in 1824, was his first important work. In 1825 he went to Paris and studied under Suisse. Doo was appointed historical engraver to William IV., and also to Queen Victoria. In 1856 he was elected a Fellow of the Royal Society, and in 1857 an Academician. Among the best known of his plates are: "The Infant Christ," after Raphael; "Ecce Homo," after Correggio; "The Pilgrims in Sight of the Holy City," after Eastlake; and especially "Knox Preaching," after Wilkie. He died November 13, 1886.

D'OOGE, dŏ'Ke, Martin Luther (1839—). An American classical philologist, born at Zonnenarie, Netherlands. He received the degrees of A.B., University of Michigan (1862); Ph.D., Leipzig (1873); LL.D., University of Michigan (1889), and became professor of Greek in the University of Michigan in 1873. He was the editor of Demosthenes, *De Corona* (Chicago, 1888); Sophocles, *Antigone* (Boston, 1885); etc.

DOO'LEY, Mr. See Dunne, Finley Peter.

DOO'LITTLE, Charles Camp (1832-1903). An American soldier, born at Burlington, Vt. In 1862, he was appointed colonel of the Eighteenth Michigan Volunteers, and subsequently served in the Peninsular campaign. He was in Kentucky in 1862-63, and Tennessee in 1863-64, was in command of Decatur, Ala., during the first day of the defense against Gen. J. B. Hood, led a brigade at Nashville, and in 1865 was placed in command of that city. For a time he was in 1865 commander of the northeastern district of Louisiana. In that year he was brevetted major-general.

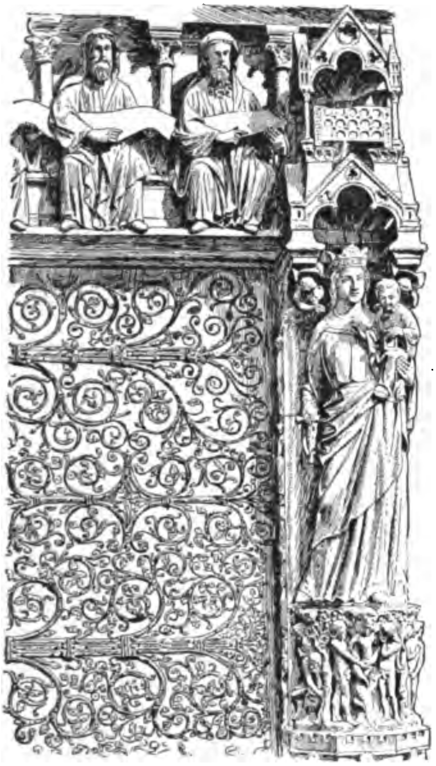
DOOM or **DUM PALM** (Ar. *daum*, dwarf palm, from *dāma*, to remain), *Hyphæne thebaica.* A species of palm, with fan-shaped leaves, remarkable for the repeated forkings of its stem, branching being unusual among palms. It is a native of Arabia, upper Egypt, and the central parts of Africa. In some districts it is the most plentiful tree, sometimes forming forests; it also grows in the bare sands of the desert. Ropes are made of the fibre of its leafstalks. Its fruit is about the size of an orange, but of a somewhat elongated, irregular shape. When the red outer skin is peeled off, a considerable thickness of a spongy dry substance is found within it, which has an insipid sweetness and a remarkable resemblance to gingerbread, so that the tree is sometimes called the gingerbread-tree. This substance is used as an article of food, and an infusion of it as a beverage is cooling, gently aperient, and very salutary in fevers. The endosperm of the seed is hard and semi-transparent, and is turned into beads and other little ornaments. Each fruit contains one seed.

DOOMSDAY BOOK. See Domesday Book.

DOOMSTER. See Deemster.

DOON, dōōn. A river of Scotland, rising in the southeast of Ayrshire, in Loch Enoch, and flowing northwest through Loch Doon, past Dalmellington, Burns's monument, and Alloway Kirk, to the Firth of Clyde, two miles south of Ayr (Map: Scotland, D 4). It is 30 miles long. On leaving Loch Doon, the river flows through Glen Ness, a picturesque rocky and wooded ravine. On an islet in the loch are the ruins of Doon Castle. Burns has immortalized the Doon in song.

DOOR (AS. *dor,* Goth. *daúr,* OHG. *tor,* Ger. *Thor;* connected with Lat. *foris,* Gk. *θύρα, thyra,* Ir., Gael. *dorus,* OChurch Slav. *dvĭrĭ,* Lith. *durīs,* Lett. *durwis,* Av. *dvara,* Skt. *dvār,* door). The movable panel by which the opening to a building, an apartment, closet, or passage is closed. Doors are made of wood, iron, bronze, or stone. The earliest doors appear to have swung, not on hinges, but in sockets; at least, some extremely early marble sockets have been found in Babylonia, from the fourth and fifth milenniums B.C., several at Sirpurla (Tello). What the style of the beautiful palace and temple doors of Babylonia and Assyria was can be judged not only from the descriptions in the historic inscriptions, but from the doors themselves, found at Balawât, which were decorated with bronze strips covered with reliefs of figured historic scenes. Other doors were inlaid with bone or ivory and overlaid with plaques of gold or silver. The antique doors of the Pantheon are famous. From Roman times bronze seems to have been the favorite material for decorating doors, on a wooden frame. But they were also elaborately inlaid under the Empire. The Byzantine method of making whole bronze doors inlaid with niello enamel and silver was probably a Roman survival. The doors of Saint Sophia (now at Saint Mark's, Venice), of Saint Paul's at Rome, of Sant' Angelo at Monte Gargano, and several others in South Italy, are examples of this technique. Another method was of hammering out thin bronze plaques, which were nailed together; of this primitive type are the gates of San Zeno, Verona. But soon bronze casting was revived in France, Germany, and Italy, and used for doors, as at Hildesheim, Augsburg (cathedral), Pisa (cathedral), Ravello (cathedral), and Monreale. Each of these doors was a mass of figured compositions in relief. The climax of doors of cast bronze was reached between the beginning of the fourteenth and the close of the sixteenth century in a series extending from the gate of Andrea Pisano at the baptistery of Florence, through the Ghiberti gates, those of Luca della Robbia (Florence cathedral), of Pollaiuolo (Saint Peter's), and finally those by Giovanni Bologna and his contemporaries at Loreto and elsewhere, which show the decadence of art.



DOOR OF THE VIRGIN, NOTRE DAME, PARIS.

Meanwhile doors merely of wood remained popular, and were often richly carved, but the perishable nature of the material has not allowed many early examples to survive. The earliest are the early Christian doors at Santa Sabina, Rome, whose reliefs of the Old and New Testament are among the finest works of the age. Those at the monastery of Grottaferata represent Byzantine art (eleventh century). It became the custom during the Gothic period to make the decoration of the wooden doors consist largely of the wrought-iron hinges, which were expanded into a maze of intricate ornamentation. The doors of Notre Dame, Paris, dating from the thirteenth century, are the finest of their class. The Renaissance of the North, in Germany and France, reverted often to elaborately carved doors, which are among the most beautiful products of wood-sculpture. Such were the doors of Beauvais Cathedral by Jean le Pot and those of Saint Maclou at Rouen by Jean Goujon. Doors made entirely of marble are very few and comparatively modern. For illustration of bronze doors, see GHIBERTI.

DOORNBOOM, dôrn′bôm (*Acacia horrida*). One of the most common trees of the arid and steppe regions of Africa. The name doornboom (*thorn-tree*), given to it by the Dutch colonists, and the botanical specific name, are due to the number and sharpness of its spines. It seldom much exceeds 30 feet in height. In house carpentry, its hard, tough timber is much used. See ACACIA.

DOORWAY (in art). The form of the doorway is determined by the architectural style of the building in which it is placed. It quickly took an important place in architectural history. In Egypt it was based on the principle of the lintel, surmounted by a strongly projecting cornice and highly developed decoration. Some Egyptian doors are of monumental proportions, like that of the Temple of Edfu, 74 feet high, with a lintel and cornice 23 feet thick. The portals between the great pylons are usually very impressive. They vary comparatively little from the beginning to the end of the style, being always of stone and decorated with colored sculptures. In Babylonia and Assyria, the arched doorway prevailed of brick, often decorated with faïence and flanked with protecting colossi; those of the city and palace gates must have been as impressive and more brilliantly colored than the Egyptian. The Persians largely imitated the Egyptians in their scheme of doorways, as is shown in the palaces of Persepolis and Susa. The primitive Greeks—Pelasgians, Achæans, etc.—used mainly the linteled doorway of huge, often unwrought, stone (e.g. Lion Gate, Mycenæ), but they knew also the form of the true and false arch. The historic Greeks confined themselves to the lintel, and evolved a type even more closely followed than the Egyptian, of which the famous doorway of the Erechtheum is the most perfect example, and next to it those at Priene and Eleusis. The lintel projected beyond the jambs, its moldings forming a sort of shoulder. The Roman doorways usually preserved the lintel, and while lacking in delicate perception of proportion, often had a superb effect from size and magnificence, as at Baalbek and Palmyra. Sometimes the arched form was used, with curving entablature. These Roman doorways reached their perfection during the second century. The triumphal and memorial arches also furnished a type of arched portal that was copied in large civil monuments. In the Early Christian and Byzantine styles doorways were of comparatively small artistic importance, owing to the decadence in ornamental sculpture and detail.

ROMANESQUE DOORWAYS. But the Romanesque art of the eleventh century developed an entirely new type of doorway, which passed with modifications into Gothic art, and even influenced the Renaissance. It was the recessed doorway, carved oftener with figured than with merely decorative sculpture. The new use of stone vaulting in place of wooden roofs in architecture necessitated the replacing of the old thin walls by very heavy thick masonry, and the desire to give artistic form to the openings cut in these masses taxed the inventiveness of Romanesque artists, and led to the new style of portaled doorways. The French schools of the Centre and South were especially prominent. The great portals of Saint Gilles and Saint Trophime at Arles, in Provence, are masterpieces of composition, combining life-size figures, reliefs, and architectural framework in a manner suggesting old Roman triumphal arches. The portals of Moissac, Vezelay, and Autun, in Burgundy, are hardly inferior. The entire façade of these and similar churches was composed in connection with the doorways, which became its principal feature. They were usually in a group of three, the central doorway, leading into the nave, being usually higher and deeper. In both these schools the human figure formed the main part of the decoration, but in other schools of central France a system of floral and geometrical ornamentation was largely substituted. The different planes in the successive recesses were marked usually by small columns, sometimes with plain, sometimes with highly decorated shafts, and above them rose corresponding rows of archivolts.

GOTHIC DOORWAYS. When the Ile de France took the lead in the middle of the twelfth century, its architects developed the pointed portal, singly or in groups of three, with severer and even more thoroughly architectural sculpture, as in the old cathedrals of Chartres, Bourges, and Le Mans, and the Abbey of Saint-Denis. Out of these sprang the unparalleled Gothic doorways of cathedral architecture, of which the masterpieces, in the thirteenth century, are at Notre Dame (Paris), Amiens, Rheims, and Chartres. The portals now project from thinner walls instead of being cut in the thickness of the walls, and, instead of being rather a structural necessity, are an artistic conception. The older style of molded archivolts is replaced by lines of figures, usually under canopies, following the same curved lines, and making it possible to have several hundred figures in each doorway. The larger part of the encyclopædic thought of the scholastic Middle Ages, its conception of the theory and history of the universe, is expressed in the sculptures of these cathedral doorways, which thus acquire an unequaled importance in the history of art. Only seldom is their importance equaled outside of France. In Italy there are a few fine examples in the north (Verona, San Donnino) and centre (Lucca, Perugia, Orvieto), but it is in the southern region of Apulia that the most beautiful Italian examples occur, especially at Bitonto, Bitetto, Altamura, and their neighborhood, dating from the thirteenth century.

After earlier essays at Bamberg and Freiberg, Germany more closely approaches the French style, which it evidently copied during the Gothic period. The portals of Strassburg are equal to the most brilliant French work (especially the portal of the Wise and Foolish Virgins); those of Freiberg and Nuremberg are not much inferior, but the sculpture was usually neither as systematic nor as generally employed. Even more decidedly French imitations are found in Spain, for example in the portals of Burgos Cathedral. English art of the Norman and Gothic periods was far less successful; its doorways were usually insignificant, with but little sculpture and poorly composed with the façade.

RENAISSANCE DOORWAYS. The Renaissance returned to a more classic simplicity in doorways, giving less prominence to them in façades and shearing them of sculpture, except occasionally the surface ornamentation of neo-classic pilaster-jamb and lintel, usually in the Arabesque style, made popular by Raphael and Giovanni da Udine in painting, and by their predecessors of the Tuscan and Lombard schools in sculpture. Some of the portals in Venice (e.g. San Zaccaria), in Florence (Duomo), and at the Certosa of Pavia represent the early stage of the Renaissance before sculpture was tabooed, but later the purist Renaissance of the sixteenth century and the Barocco of that and the following century, discarded sculpture more rigorously, even in religious work. The arch was used more frequently than the lintel, bossed work becoming more and more popular. The recess idea had been discarded at the beginning of the Renaissance. The doorway has never since regained its mediæval importance.

BIBLIOGRAPHY. Illustrations and descriptions of portals are scattered through the histories of architecture and systematic collections of plates and photographs. For Apulian portals, consult Moscione's Collection of Photos; for French, the Robert Milusement Collection of Government Photos. The examples in southern France are given in Revoil, *L'architecture romane du midi de la France* (Paris, 1873); and other French examples are given under "Porte" and "Portail," in Viollet-le-Duc's *Dictionnaire raisonné de l'architecture française* (Paris, 1854-68).

DOP'PLER, CHRISTIAN (1803-53). An Austrian physicist and mathematician, born in Salzburg (crownland of that name). He studied at the Polytechnical Institute of Vienna, and became an instructor in mathematics there. Subsequently he held various academic appointments, including those of professor of elementary mathematics and practical geometry in the Technical Institute at Prague (1841-47), professor of practical geometry in the Polytechnikum of Vienna (1848-51), and director of the physical institute of Vienna University (1851-53). He is best known as the first to enunciate the well-known Doppler's principle (q.v.) (in his monograph *Ueber das farbige Licht der Doppelsterne,* 1842). His further works include *Versuch einer systematischen Klassifikation der Farben* (1848).

DOPPLER'S PRINCIPLE. A law in physics enunciated by Christian Doppler, an Austrian physicist, in 1842. If a body which is emitting waves of any kind recedes from the instrument which is receiving the waves, the wave-number is apparently decreased; and conversely, if the vibrating body approaches the receiving instrument, the wave-number is increased. Similar statements can be made, in general, of the effect of making the receiving instrument move away from or toward the vibrating source. This alteration in wave-number is called 'Doppler's Principle,' having been first stated in 1842 by Prof. Christian Doppler, of Prague. If the natural velocity of waves in the medium connecting the vibrating body and the receiving instrument is V, if the velocity of *approach* of the vibrating body is v, and if N is the natural wave-number of the waves, the new wave-number will be N^1, where

$$N^1 = N\frac{V}{V-v};$$

whereas, if v is the velocity of *recession* of the vibrating body,

$$N^1 = N\,\frac{V}{V+v}.$$

If, however, the vibrating body is not moving, but the receiving instrument is *receding* with a velocity v, then

$$N^1 = \frac{N}{V}\,(V-v);$$

and, if v is the velocity of *approach* of the receiving instrument,

$$N^1 = \frac{N}{V}\,(V+v).$$

Illustrations of Doppler's principle are afforded in acoustics and in light. If a sounding body, e.g. a whistling locomotive, is approaching a listener, the pitch of the note heard is higher than when it is at rest or when receding. Similarly, if a source of light, e.g. a star or one edge of the rotating sun, is approaching an observer rapidly, the color due to any train of waves in the radiation produced in the human eye is not what would be seen if there were no relative motion in the line of sight; the color actually seen will be slightly shifted toward the blue portion of the spectrum. If a photographic plate is used to record the radiation, the actual change in wave-number can be measured, and thus an idea obtained of the velocity of the source of light.

DOQUET. See DOCKET.

DOR, DOR-BEETLE, *or* DOR-BUG. See CHAFER; JUNE-BUG.

DORE, dōr, or MONT DORE (often erroneously written Mont d'Or). A mountain mass in France, comprised in the great group of Auvergne (q.v.) Mountains in the Department of Puy-de-Dôme (Map: France, J 6). They are of volcanic formation, and rise in the Puy-de-Sancy, which is the highest peak of central France, to the height of 6190 feet.

DO'RA. A play by Sardou, produced in 1877, and popular in an English version under the title of *Diplomacy*.

DORA, SISTER. See PATTISON, DOROTHY WYNDLOW.

DO'RAB. A fish (*Chirocentrus dorab*) of the Red Sea, Indian Ocean, and Malayan waters, allied to the herrings, but having some remarkable peculiarities of structure characterizing the separate family Chirocentridæ. "The upward direction of the cleft of the mouth, which is armed with formidable teeth, coupled with the elongation of the lower jaw, gives a rather peculiar expression to the head, and the eyes are remarkable for being covered with skin. . . . As this fish attains a length of more than a dozen feet, it is a sufficiently formidable monster, and when captured is said to bite viciously at any object within reach. Its flesh is of poor quality."

DO'RAD. A mailed catfish of the Amazonian genus Doras. See CATFISH and HASSAR.

DORA D'ISTRIA, dō'rȧ dĕ'strē-ȧ (1828-88). A pseudonym of Helen Ghika, Princess Koltzoff-Massalsky. She was the niece of Prince Alexander Ghika, Hospodar of Wallachia, and was born at Bucharest, January 22, 1828. Thoroughly instructed in the classics under the care of Professor Pappadopoulos, she added to these by frequent travels through Germany, France, and Italy an extensive knowledge of modern languages and literature. At the age of fifteen she commenced a translation of the *Iliad* into German, and not long afterwards wrote several pieces for the theatre. After her marriage with Prince Koltzoff-Massalsky she accompanied her husband to the Court of Saint Petersburg. Her first important work, *La vie monastique dans l'église orientale*, was published at Paris and Geneva in 1855. This was followed by two works, *Gli eroi della Rumenia* and *I Rumeni ed il papato*. Her studies in Switzerland resulted in a work entitled *La Suisse allemande*. She received an official invitation in 1865 to attend the sixth centenary festival in honor of the birthday of Dante. This event she described vividly in *Pèlerinage au tombeau de Dante*. In 1867 she went to Venice to examine the ample archives of that city; but the first thing she did was to publish *Venise en 1867*. Afterwards she showed the fruits of her researches in *Les Albanais musulmans* and *Gli Albanesi nella Rumenia; storia dei principi Ghika nei secoli XVII., XVIII., XIX.* (1873). In 1868 she gave some account of her own active life in *Di alcune opere della principessa Dora d'Istria*, a work which reappeared in 1871 under the title, *Dora d'Istria e la poesia albanese*. Her work, *Des femmes par une femme* (1864), was translated into Russian, Italian, and English. She died at Florence, November 17, 1888.

DORALICE, dō'rȧ-lĕ'chȧ. (1) One of the stories in Straparola's *Nights*, and an old version of *Cinderella*. (2) In Ariosto's *Orlando Furioso*, the daughter of the King of Granada, and wife, first of Mandricardo and then of Roger. (3) The fair, shrewd wife of Rhodophil in Dryden's *Marriage à la Mode*.

DO'RAN, JOHN (1807-78). An English miscellaneous writer, descended from an old Irish family of Drogheda. He was born in London. He acquired from his father, who had lived in France, a good knowledge of French. From 1823 to 1828 he was on the Continent as tutor to a young nobleman. He had already become a contributor to the *Literary Chronicle*. When only seventeen he wrote a melodrama, which, under the title of *Justice, or the Venetian Jew*, was produced at the Surrey Theatre in 1824. Four years later he published a selection from his contributions to the press—*Sketches and Reminiscences;* and in 1835, *History of Reading*. In 1854 appeared *Habits and Men*, and *Table Traits*, followed by *Lives of the Queens of the House of Hanover* (1855); *Knights and Their Days* (1856); *Monarchs Retired from Business* (1857); *History of Court Fools* (1858); *New Pictures and Old Panels* (1859); *The Princes of Wales* (1860); and a *Memoir of Queen Adelaide* (1861). In 1864 he produced *Their Majesties'*

Servants, a history of the stage from Betterton to Kean (new ed. by Lowe, 1887); in 1868, *Saints and Sinners;* and in 1873, his most interesting work, an account of Mrs. Elizabeth Montagu and the 'blue-stockings' of her day, under the title of *A Lady of the Last Century*. In 1876 appeared *Mann and Manners*, based on the letters of Sir Horace Mann to Horace Walpole, followed by *London in Jacobite Times* (1877), and *Memories of Our Great Towns* (1878). After his death was published *In and About Drury Lane*. Doran was closely connected with the *Athenæum*, and at the time of his death was editor of *Notes and Queries*.

DORANTE, dŏ'räɴt'. (1) The character in Corneille's *Le menteur* (The Liar), after whose favorite vice the play is named, and who in the *Suite du menteur* has reformed. (2) A gallant in Molière's *Critique de l'école des femmes*, who defends *L'école des femmes* and its author. (3) A count, the suitor of the Marquise Dorimène, in Molière's *Le bourgeois gentilhomme*.

DORAS'TUS and **FAW'NIA.** The chief characters in Robert Greene's romance, *Pandosto* (1588), and originally the sub-title, in later editions the main title, of the romance.

DORAT, dŏ'rȧ', CLAUDE JOSEPH (1734-80). A French poet, born in Paris. He was at first an advocate, then a mousquetaire, and finally gave himself up to authorship. His works include almost every form of verse and prose, plays, fables, madrigals, romances, and letters. The plays are decidedly mediocre. He celebrated the 'little nothings' of his day in elegant but stilted and affected verse, and may be summed up as a boudoir poet. His best-known romance is *Les sacrifices de l'amour*, a series of letters between the Vicomtesse Senanges and the Chevalier de Versenay.

DORAT, JEAN. See DAURAT, JEAN.

DO'RAX. A Portuguese renegade, formerly Don Alonzo de Sylvera, Governor of Alcazar, in Dryden's tragedy *Don Sebastian;* considered the chef d'œuvre of Dryden's tragic characters.

DOR'CAS (Lat. gazelle, Gk. *δορκάς*, *dorkas*, from *δέρκεσθαι*, *derkesthai*, to look, Skt. *darś*, to see) **GAZELLE.** One of the commonest gazelles (*Gazella dorcas*) of the hilly parts of the central Sahara desert, where in winter it gathers into large herds. It also occurs in Syria. It is about two feet high and fawn-colored, with the rump, abdomen, inside of the legs, and ears white; conspicuous white streaks encircle the eyes and curve down to the nostrils. Both sexes bear relatively long and slender horns. It is locally called by the Sahara Arabs "rhezal" and "hemar." See GAZELLE; and Plate of GAZELLES.

DOR'CHESTER. A port of entry, the capital of Westmoreland County, New Brunswick, Canada (Map: New Brunswick, E 4). It is situated on the Memramcook River, two miles from Shepody Bay, and has a station on the Intercolonial Railway, 115 miles northeast of Saint John. It carries on a considerable export trade in building-stone from neighboring quarries, in gas-coal, and in lumber. The penitentiary of the Maritime Provinces is on a hill overlooking the town. Pop. of township in 1902 (est.), 7000.

DORCHESTER. A municipal borough and the capital of Dorsetshire, England, on the Frome, about eight miles north of Weymouth (Map: England, D 6). The town is clean and well built, and almost surrounded by avenues of beautiful trees. The Church of Saint Peter contains some curious monuments. Among the other notable buildings are the guildhall, county building, corn exchange, county prison, and barracks. The county museum contains an excellent collection of antiquities. The town owns its water-supply, markets, and the corn exchange. Its chief industry is the brewing of ale and beer, and the production of butter for the London market. Its markets for cattle and cereals are important. Population, in 1891, 8000; in 1901, 9500. Near Dorchester are the remains of the most perfect Roman amphitheatre in England. Its dimensions are 218 by 163 feet, and 30 feet deep. The seats, rising from the arena cut in the chalk, are capable of holding 13,000 spectators. Poundsbury and Maiden Castle are two intrenched camps, the first perhaps of Roman origin, the second of British. Dorchester, British in origin, was the Roman Durnovaria, or Durinum, a walled town with a fosse. During the Civil War it was fiercely Parliamentarian. At Dorchester, in September, 1685, Judge Jeffreys, in his 'Bloody Assize,' sentenced 292 persons to death for participation in the Monmouth Rebellion.

DORCHESTER. Formerly a town in Norfolk County, Mass., but since 1870 a ward of the city of Boston. Dorchester was settled in June, 1630, by a company of Puritans headed by their pastors, Warham and Maverick. The settlement was originally called Mattapan, but later in the year was named after Dorchester, England, the home of some of the emigrants and of Rev. John White, their former pastor. It antedates Charlestown and Boston, and was described in 1633 as 'ye greatest towne in New England.' From it, in 1635, went the company under Roger Ludlow which founded Windsor, Conn.; and also, in 1695, the company which ultimately founded Midway, Ga. By fortifying Dorchester Heights, on March 5, 1776, Washington forced the English to evacuate Boston. The original town comprised Sharon, Canton, Milton, Stoughton, and Foxboro, besides parts of Wrentham and Dedham. Dorchester was the birthplace and early home of Edward Everett. Consult: Orcutt, *Good Old Dorchester, A Narrative History of the Town, 1630-1893* (Cambridge, 1893); and Everett, *Dorchester in 1630, 1776, and 1855*, an oration delivered on July 4, 1855 (Boston, 1855).

DORCHESTER, DANIEL (1827—). A Methodist Episcopal clergyman. He was born in Duxbury, Mass., and was educated at Wesleyan University, Connecticut. For three terms of four years each, he was a presiding elder, and was a member of the Connecticut State Senate in 1854. In 1822 he was a member of the Massachusetts House of Representatives. From 1881 to 1885 he was historiographer of the New England Methodist Historical Society, and in 1885 was president of the National League (non-sectarian) for the Suppression of the Liquor Traffic, and for some time was Superintendent of Indian Schools for the United States. Among his published works are: *Concessions of Liberalists to*

Orthodoxy (1878); *Problems of Religious Progress* (1881); *Giving and Worship* (1882); *Latest Drink Sophistries Versus Total Abstinence* (1883); *The Liquor Problem in All Ages* (1884); *The Why of Methodism* (1887); *Christianity in the United States* (1888); and *Romanism Versus the Public School System* (1888).

DORDOGNE, dōr'dō'ny'. A river of south central France, formed by the junction of the Dor and Dogne at the foot of Mont Dore (Map: France, G 7). It flows west through the departments of Corrèze, Lot, Dordogne, Gironde, and joins the Garonne thirteen miles north of Bordeaux. It is about 305 miles long, and navigable to Souillac, about 186 miles. Ocean steamers ascend to Libourne.

DORDOGNE. A southwestern department of France, formed of the ancient Province of Périgord, with small portions of Limousin, Angoumois, and Saintonge (Map: France, G 6). Area, 3561 square miles. Population, in 1896, 464,822; in 1901, 452,951. The surface is hilly, with occasional valleys of extraordinary beauty and fertility, the borders of which are generally covered with vineyards. There is a deficiency of corn, but a large output of chestnuts. Capital, Périgueux.

DORDRECHT, dōr'drĕKt, or **DORT.** A town of the Netherlands, in the Province of South Holland, situated on an island in the Merwede (Meuse delta), twelve miles southeast of Rotterdam (Map: Netherlands, C 3). The town presents a mediæval appearance, and has a large Gothic Groote Kerk, with a fine nave and tower. The Merwede here forms a spacious harbor. The trade of the town in wine and lumber is considerable, and there are flour-mills and sawmills, iron and salt works, and shipyards. Population, in 1892, 34,125; in 1899, 38,386; in 1905, 44,022. Dordrecht was founded by Count Dietrich III. of Holland in 1018, and during the Middle Ages it was the foremost commercial town of the country, and a member of the Hanseatic League. The first assembly of the independent States of Holland was held here in 1572, and it was the meeting-place of the famous Synod of Dort (1618-19), which affirmed the doctrines of Calvin. (See DORT, SYNOD OF.) The city was formerly on the mainland, but was separated from it by the inundation of 1421.

DORÉ, dō'rā', PAUL GUSTAVE (1833-83). A French illustrator, painter, and sculptor. He was born at Strassburg, January 6, 1833, the son of an engineer. His talent was very precocious. At the age of ten he drew sketches for lithographs, and in his fifteenth year he was regularly employed as an illustrator by the *Journal pour Rire*, at the same time exhibiting series of pen sketches in the Salons. He had but little education in art, and the demand for his designs was too great to allow him the requisite leisure for technical training. As a caricaturist he was successful, but he soon turned his attention to the illustration of books. His *Rabelais Illustré*, which appeared in 1854, established his reputation, and this work was followed by an incredible number of others, equally famous. He was not only popular in France, but in the United States and throughout Europe, especially in England, where there was a Doré cult. He worked with amazing facility and fecundity, acquiring great sums of money through his art. He was made a Chevalier of the Legion of Honor in 1861, and Officer in 1879. He died in Paris, January 23, 1883.

Doré's reputation as an artist is due to his illustrations, in which his wonderful imagination, his dramatic sentiment, and his astonishing fecundity had opportunity for full sway. His drawing, however, is often faulty. He uses landscape with success, especially in order to obtain the weird and gloomy effects in which he excelled. Sometimes, as, for example, in his last great work, *Orlando Furioso* (1880), his imagination runs riot, and his work becomes exaggerated and bizarre. His chief masterpieces of engraving, besides the *Rabelais*, mentioned above, are *Don Quixote* (1863) and Dante's *Inferno* (1861). Among the numerous other works which he illustrated were Balzac's *Contes Drolatiques* (1856), *Atala* (1862), the *Bible* (1864), and La Fontaine's *Fables* (1866). He illustrated a number of important works of English literature, among which are Milton's *Paradise Lost* (1866), Tennyson's *Idylls of the King* (1867-68), Coleridge's *Ancient Mariner* (1876), and Poe's *Raven* (1883).

Doré aspired to be an historical painter, and, with his accustomed facility, created many works, mostly of colossal proportions. In these his lack of technical training is particularly conspicuous, especially his faulty drawing and his lack of color sense. The English, however, made much of his painting, and there was for a long time a permanent exhibition of his pictures in London. His first exhibited canvas was the "Battle of the Alma" (1855), and the best of his paintings are "Francesca da Rimini" and the "Neophyte" (1868). His large canvases, "Christ Leaving the Prætorium," and "Christ's Entry into Jerusalem," attracted much attention. Doré's landscapes and aquarelles are worse than his figure pieces. In them the artist strives after scintillating effects, but shows no real feeling for nature.

As a sculptor his technical deficiencies are even more evident. His best-known work is the monument to Alexandre Dumas in the Place Malesherbes, Paris. But he was more successful in a colossal vase, exhibited in the Exposition Universelle of 1878, and now in Golden Gate Park, San Francisco. The vase represents the "Vintage," and is decorated with numerous little figures of geniuses and animals, in which, in a graceful and delightful manner, the artist has expressed his exuberant fantasy.

Consult: Delorme, *Gustav Doré* (Paris, 1879); Roosevelt, *Life and Reminiscences of Gustav Doré* (London, 1885); Jerrold, *Life of Gustave Doré;* Claretie, *Peintres et sculpteurs contemporains* (2d series, Paris, 1884); Hamerton, in *Fine Arts Quarterly Review*, vol. iii. (London, 1864).

DOREE. A local name in French-speaking parts of Canada for the wall-eyed pike (Stizostedion).

DORE'MUS, ROBERT OGDEN (1824-1906). An American chemist, born in New York City. He graduated in 1842 at the New York University, pursued studies in chemistry in Paris in 1847-48, established a chemical laboratory in New York in 1848, and graduated from the medical department of the New York University in 1850.

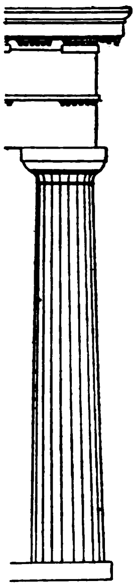
In 1861 he was appointed professor of chemistry and toxicology in the Bellevue Hospital Medical College, and in 1864 professor of chemistry and physics in the College of the City of New York. He patented several chemical processes, including methods of fire-extinguishing.

DOREMUS, Mrs. Sarah Platt (Haines) (1802-77). An American philanthropist, born in New York City. She early became interested in missionary and philanthropic enterprises, and was active in organizing relief societies and in founding permanent homes and hospitals, particularly for women. Among these may be mentioned the Isaac T. Hopper Home for women discharged from prison, the House and School of Industry for poor women, and the New York Woman's Hospital. In 1860 she established the Woman's Union Missionary Society. Her efforts in behalf of the wounded soldiers during the Civil War occupy a prominent place among her many noble works.

DORIA, dō′rĭ-ȧ, Andrea (c.1468-1560). A Genoese admiral. In the first half of his long career he fought in the service of various Italian princes. When Genoa was freed from French domination at the close of the reign of Louis XII., Doria, at the age of about 45 years, was appointed captain-general of the galleys, and cleared the northern Mediterranean of African pirates. During the first war between Francis I. of France and Charles V., Doria commanded the French fleet, reinforced by his own galleys, and inflicted everywhere severe losses upon the enemy. After the defeat of Francis I. near Pavia (1525) Doria accepted the command of the Papal fleet; but upon the return of the King from captivity entered once more the French service, with the title of High Admiral of the Levant. He blockaded Genoa because it had espoused the cause of the Emperor, but finding the independence of his country threatened by the French, Doria with his whole force went over to the Emperor, and by so doing hastened the deliverance of Italy from French domination. In 1528 Doria entered Genoa without resistance, and, refusing the title of sovereign, offered by the Emperor, established a new form of government, which remained in vigor up to the end of the Republic. The grateful country decreed him the title of 'Father of Peace.' In 1532 Doria won a decisive victory over the Turks near Patras, and the conquest of Tunis (1535) was chiefly his work. He distinguished himself in the disastrous expedition of Charles V. against Algiers in 1541. Disturbed in his last years by the conspiracy of Fiesco (q.v.), Doria took fierce revenge upon the conspirators for the death of his nephew, Gianettino. He died without offspring at Genoa in the ninety-third year of his life. Consult: Petit, *André Doria* (Paris, 1887); Guerrazzi, *Vita di Andrea Doria* (Milan, 1874).

DORIANS (Gk. Δωριεῖς, *Dōrieis*, Lat. *Dores*, from Gk. Δωρίς, *Dōris*). One of the principal peoples of ancient Greece. According to the legend, they took their name from Dorus, the son of Hellen, who settled in Doris (q.v.), which was always regarded by the Dorians as their mother country. The ancestors of the Dorians seem to have come from the north or northwest, under the pressure of the great southward movement of the Illyrian tribes, which brought to a close the Mycenæan age in Greece. At first they probably occupied much of the later Phocis and Locris, and were only later forced back into the little mountain district of Doris. From the north coast of the Corinthian Gulf they seem to have crossed to the Peloponnesus, and made extensive voyages from Naupactus. Dorians invaded and occupied Crete, and though the northern coast of the Peloponnesus was not conquered, other adventurers seem to have attacked by sea Laconia, Argolis, and Corinth. Only in Laconia do the invaders seem to have kept themselves separate from the conquered tribes, and the Spartans were always regarded as the representatives of the unmixed Dorian blood. In Greek legend this conquest of Peloponnesus was connected with the mythical return of the Heraclidæ, or descendants of Heracles, and placed about B.C. 1104. It is probable that the migrations did occur during the twelfth and eleventh centuries B.C. From Peloponnesus the Dorians colonized the southwest corner of Asia Minor and the neighboring islands, and planted settlements in Sicily and southern Italy. In historical times the Dorians seem, in general, characterized by a conservative and somewhat stolid character, though by no means insensible to art and poetry. Consult: K. O. Müller, *Die Dorier* (2d ed., Breslau, 1844); Busolt, *Die Lakedaimonier und ihre Bundesgenossen* (Leipzig, 1878); Wilamowitz, *Euripides' Herakles* (2d ed., Berlin, 1895); and the histories of Greece by Grote, Beloch, Busolt, Holm, and Ed. Meyer. For the Doric dialect, see **Greek Language.**

DORIC ORDER. The oldest and simplest of the three Greek orders. It was derived either from Egyptian columns, such as those in the tombs at Beni-Hassan, or more probably from early Mycenæan forms. In any event the original prototype of the Doric Order was probably constructed of wood, which fact, as Chipiez points out, would account for various distinctive elements in the order. In Greece, where it was very popular from about B.C. 600, its characteristics were a slightly tapering fluted shaft, whose intersecting edges were sharp; no base or pedestal; a round and simple capital, above which was an architrave with one vertical face; above that a frieze with square spaces for sculptural ornamentation, and finally, surmounting the whole, a simple cornice. The best remains of the pure Doric order are found in Greece and Sicily, the oldest example being the Temple of Corinth (about B.C. 650), and the best-known specimen the Parthenon at Athens (B.C. 438). The Romans adopted the Doric order, but changed its character and enriched it, sometimes giving it a base, and adding various Tuscan features. Even then, however, it was little used. The Italian architects of the sixteenth century also had a Doric order, but it was essentially different from the original form, being rather a derivative of the Roman type than of the Grecian. (For detailed treatment of the order, see Column; En-



DORIC COLUMN.

TABLATURE.) In Perrot and Chipiez, *Art in Primitive Greece* (translated from the French, London, 1894), the origin of the Doric order is traced back to the early Mycenæan palaces.

DOR'ICOURT. A wit in Mrs. Crowley's comedy *The Belle's Stratagem.*

DOR'IGEN. The virtuous heroine of Chaucer's *Franklin's Tale,* and the wife of Arviragus. Having refused to tolerate the proposals of Aurelius until the very rocks on the seashore should be removed, she was obliged by her husband to yield when Aurelius accomplished this impossible task by magic. Happily, Aurelius was filled with pity, and gave her back her promise.

DORIGNY, dô'rē'nyā', NICOLAS (1657-1746). A French engraver, born in Paris. He was the most celebrated of a well-known family of artists. His father, MICHEL (c.1617-66), a pupil of Vouet, was a painter and etcher. His brother LOUIS (1654-1742), a painter and engraver, was a pupil of Michel Dorigny and of Lebrun, and afterwards went to Verona, where he lived many years. Most of his work is still in that city. During a visit to Austria, he executed his best work, the frescoes in the Church of Santa Maria Maggiore, at Trent. Nicolas was a pupil of his father. He spent twenty-eight years in Italy, and, after his return to France, was called to England to engrave the complete set of cartoons after Raphael, originally designed for the Vatican tapestries, and bought by Charles I. They represent scenes from the New Testament. After this labor of fifteen years, he returned to Paris, and was made a member of the Academy (1725). His etchings are in the style of those by Audran; they include a number of plates after Raphael. His paintings were of historical and religious subjects, and are of less value.

DOR'IMANT. A libertine and wit, the original of whom is said to have been the Earl of Rochester, in Etherege's comedy *The Man of Mode, or Sir Fopling Flutter.*

DORIMÈNE, dô'rē'mân'. (1) The lively young wife of old Sganarelle in Molière's *Le mariage forcé* and *Le cocu imaginaire.* (2) The lady-love of Dorante in Molière's *Le bourgeois gentilhomme.*

DORIN'DA. (1) The sister of Miranda in Dryden and Davenant's adaptation of Shakespeare's *Tempest.* (2) The heroine of Farquhar's *The Beaux' Stratagem.*

DORINE, dô'rēn'. Marianne's attendant in Molière's *Tartufe.* She is outspoken in regard to the family follies, but a faithful servant.

DO'RION, *Fr. pron.* dô'rē'ôN', Sir ANTOINE AIMÉ (1818-91). A Canadian politician and lawyer. He was born at Sainte Ann de la Perade, was educated at Nicolet College, and was admitted to the bar in 1842. He represented Montreal from 1854 to 1861, and Hochelaga from 1862 to 1867, in the Canadian Assembly; and was a member of the Dominion Parliament for Hochelaga from 1867 to 1872, when he was returned for Napierville, which he represented until 1874. During his political career he was a leader of the *Rouge* or French-Canadian Liberal Party. He was successively Commissioner of Crown Lands, Provincial Secretary, Attorney-General of Lower Canada, Minister of Justice, and, after 1874, Chief Justice of the Province of Quebec. He was knighted in 1877.

DO'RIS (Lat., from Gk. *Δωρίς*). A small mountainous district of ancient Hellas, between Phocis, Ætolia, and Locris. With its four towns, Boium, Cytinium, Erineus, and Pindus, it formed the Doric Tetrapolis, which suffered severely in the Phocian, Ætolian, and Macedonian wars. Doris was also the name of the southwestern part of Caria, together with the islands of Cos and Rhodes, where were situated Dorian colonies, which formed at one time a hexapolis. In modern Greece, Doris forms an eparchy in the nomarchy of Phocis. Consult Lolling, in *Athenische Mittheilungen,* vol. ix. (Athens, 1884).

DORIS. See NUDIBRANCHIATA.

DORISLAUS, dō'rēs-lous, ISAAC (1595-1649). A Dutch-English scholar, lawyer, and diplomatist, born at Alkmaar, North Holland. He studied at the University of Leyden, removed to England, and in 1627 was appointed to the chair of history, newly established at Cambridge by Lord Brooke. From this professorship he was soon compelled to withdraw for his justification of the Dutch revolt against Spain. In 1629 he became a member of the College of Advocates, in 1640 was appointed Judge Advocate, and in 1648 a judge of the Court of Admiralty. He assisted in the trial of Charles I., and in 1649 was sent by the Council of State of the Commonwealth to conclude a treaty between England and the Dutch Republic. He was murdered at The Hague by a party of Royalists. He published a monograph, entitled *Prœlium Nuportenum* (1640).

DORK'ING. A market-town of Surrey, England, in a picturesque valley on the Mole, 23 miles southwest of London, on the ancient Roman road between London and Chichester (Map: England, F 5). Its chief trade is in flour, and in lime and chalk from adjacent pits. Dorking gives its name to a five-toed breed of domestic fowl. Population, in 1891, 7100; in 1901, 7700. Near the town is Deepdene, the beautiful country-seat of the Duke of Marlborough, where Disraeli wrote *Coningsby.*

DORK'ING (from *Dorking* in England). A long-established breed of domestic fowls, distinguished chiefly by the presence of a fifth toe on the hinder part of the foot below the spur. The breed is especially valuable for the table. See FOWL; and Colored Plate of FOWLS.

DORKING, BATTLE OF. The history of an imaginary invasion of England, written by General George J. Chesney, in 1871, to call attention to the weakness of British defenses.

DORMANT (Fr., sleeping). A term in heraldry denoting an animal with its head resting on its fore paws.

DORMER (OF. *dormeor,* sleeping-room, from Lat. *dormitorium,* from *dormire,* to sleep; so called as being primarily a bedroom window), or DORMER WINDOW. A window placed in a small gable projecting from a sloping roof, often used to enlarge and to light the attic or garret rooms of buildings; it usually projects so as to be flush with the main wall. The dormer appears in early Gothic buildings, and becomes a rich feature of late Gothic stone and timbered architecture and of the Renaissance.

DORMITORY (Fr. *dormitoire*, Lat. *dormitorium*, from *dormire*, to sleep). A sleeping apartment in a monastery or other religious establishment, or in a large school or other institution, such as a college or university. The dormitories of mediæval monasteries were often of artistic interest, being large halls divided lengthwise by rows of columns. They were of two types: (1) The open hall where all slept, together or separated merely by low wooden partitions, with hangings at the entrances; (2) a building with separate cells opening from a corridor. The first was the primitive Benedictine type, and was brought back among the Cistercians by Saint Bernard, but the self-indulgent order of Cluny (tenth century) had allowed to each monk a separate cell, and this became the general custom after the fourteenth century.

DORMOUSE (from archaic *dorm*, to sleep, from Icel. *dorma*, from Lat. *dormire*, to sleep + *mouse*). A small, arboreal rodent of the Old World family Myoxidæ. The dormice, in adaptation to a squirrel-like existence, have come to resemble those animals in miniature, but in organization are much more nearly allied to the true mice (Muridæ). There are four molar teeth on each side in each jaw, their summits marked by transverse ridges. There are no cheek-pouches and no cæcum. The ears resemble those of mice. The fur is very fine and soft. The tail is long and somewhat squirrel-like. The dormice are beautiful little animals, natives chiefly of the south of Europe; but some species are also found in Asia and Africa, and the genus Graphiurus is entirely African. Four genera, containing about a dozen species, are included in the family. The best-known species is the red dormouse, muscardine, or hazel mouse (haselmaus) (*Muscardinus avellanarius*), an inhabitant of woods in most parts of Europe. It is about the size of a house mouse, with head proportionally large; has a rather pointed muzzle; large, prominent eyes, and a flattened tail thickly clothed with rather long hair; and is of a tawny red color on the upper parts, and white beneath. It is extremely gentle and easily tamed; feeds on beech-mast, acorns, hazelnuts, grain, etc.; and spends the colder parts of winter in a state of torpidity, although in mild weather it wakens up to consume a little of the store of food which, like squirrels, it lays up for that season. It makes a nest of tangled or interlaced herbage, entered from above, usually in some copse or underwood, and produces about four young ones at a birth. It often assumes a remarkable posture in feeding, suspending itself by its hind feet; more generally it sits upon its haunches and holds its food in its fore paws. The fat dormouse (*Myoxus glis*) is a larger species, grayish brown, about the size of a rat, with a tail very much like that of a squirrel, and is a native of the south of Europe, where it inhabits forests, leaping from branch to branch with great agility. The garden dormouse (*Eliomys nitela*), common in Europe as far north as Poland, is frequently found in gardens, and even in outhouses. It is often very destructive of the fruit of wall and espalier trees. It is rather smaller than the fat dormouse, and has the tail tufted only at the extremity. It is called 'lerot' in France and 'Gartenschläfer' in Germany.

DORN, Alexander von (1838—). An Austrian political economist, born at Wiener-Neustadt. He became editor of the *Triester Zeitung* in 1872, and in 1884 established at Vienna the *Volkswirtschaftliche Wochenschrift*—a publication followed in 1888 by the *Exportkompass*, a commercial year-book of the Austro-Hungarian monarchy. He was editor of the illustrated work entitled *Die Seehäfen des Weltverkehrs* (1889 et seq.), and in 1885 published the important work *Kriegsmarine und Volkswirtschaft in Oesterreich-Ungarn*.

DORN, Johann Albrecht Bernhard (1805-81). A German-Russian Orientalist, born at Scheuerfeld, Duchy of Coburg. He studied at Halle and Leipzig, and later successively became professor of Oriental languages at the University of Kharkov (1826), professor of the history and geography of Asia at the Oriental Institute, Saint Petersburg (1835), director of the Asiatic Museum (1842), and chief librarian of the Imperial Public Library (1843). His works, which are devoted to the history and language of Afghanistan and Caucasia, include: *Caspia. Ueber die Einfälle der alten Russen in Tabaristan* (1875); *A Chrestomathy of the Pushtu, or Afghan Language* (with a glossary, 1847); and *History of the Afghans, translated from the Persian of Neamut-Ullah* (1829-36). The last-mentioned two works were written by the author in the English language.

DORNER, dôr′nẽr, Isaak August (1809-84). A German theologian. He was born at Neuhausen ob Eck, Württemberg, June 20, 1809, the son of a Lutheran minister. He studied at Tübingen, and became a professor there in 1838, at Kiel, 1839, and in 1843 professor of divinity and councilor of the consistory at Königsberg. From 1847 to 1853 he held a chair at Bonn, then removed to Göttingen, and in 1861 was appointed professor of systematic theology and exegesis in the University of Berlin. His best-known work is the *History of the Development of the Doctrine of the Person of Christ* (1861-63). Other works, translations of which have been published, are: *History of Protestant Theology* (1871); *System of Christian Doctrine* (1880-84); *Christian Ethics* (1887). He died at Wiesbaden, July 8, 1884. He was a strong upholder of evangelical Christianity, as opposed to German rationalism. His eschatological views, which were not fully in accord with the prevalent theology, were separately translated by Newman Smyth, *Dorner on the Future State* (New York, 1883). Consult the important *Briefwechsel zwischen H. L. Martensen und I. A. Dorner* (Berlin, 1888).

DOR′NICK, DORNIC, or **DORNOCK**. A species of linen damask. Dornicks were formerly made in considerable quantity at Dornich, or Tournay, in the Netherlands, and hence their name. From this place, the manufacture was probably carried to Norfolk by the Dutch, who emigrated thither during the persecution of the Duke of Alva.

DORNOCH, dôr′nôɢ. A royal burgh and the capital of the County of Sutherland, Scotland, situated near the entrance to the Dornoch Firth—an inlet of the North Sea, running 25 miles inland, and separating Sutherland from Ross and Cromarty (Map: Scotland, D 2). The cathedral, built about 1245, by Bishop Gilbert Murray, was partially destroyed by fire in 1570, but was restored in 1837, and is now used as the parish church. Dornoch was, in olden times, the residence of the bishops of Sutherland and Caithness. The town is a favorite summer resort on account of its excellent golf links and sea-bathing. Population, in 1901, of royal municipal burgh, 624; of civil parish, 5160.

DORNRÖSCHEN, dōrn'rēs-ken. The German equivalent for 'The Sleeping Beauty.'

DOROHOI, dō'rō-hō'ē. A town of northern Rumania, situated near the Austrian frontier (Map: Balkan Peninsula, F 1). It is connected by rail with Jassy, and has a population of (1899) 12,701, of whom nearly 7000 are Jews.

DOR'OTHE'A. (1) An unfortunate lady, whose story is told in Cervantes's *Don Quixote*. She is deserted by her husband, but is reunited after a number of adventures. (2) The heroine of Goethe's idyllic poem "Hermann und Dorothea," a religious refugee, who is finally married to Hermann. (3) The courageous Scottish Queen in Greene's *James the Fourth*, who sacrifices herself for the good of her country. (4) The over-serious Miss Brooke in George Eliot's *Middlemarch*, infatuated with the learned Casaubon, but disillusioned after marriage with him.

DOROW, dō'rō, WILHELM (1790-1846). A German archæologist, born in Königsberg. He held various diplomatic positions from 1812 to 1827. In the latter year he visited Italy, where he began an important series of excavations which resulted in numerous discoveries and the valuable collection of Etruscan antiquities now owned by the Berlin Museum. He published *Etrurien und der Orient* (1829); *Voyage archéologique dans l'ancienne Etrurie* (1829); and other works.

DORÓZSMA, dō'rōzh-mō. A market town of Hungary, in the County of Csongrád, about 10 miles west-northwest of Szegedin, and in the midst of a fertile country (Map: Hungary, G 3). The inhabitants are largely engaged in cattle-raising. There are several salt lakes near by. The town was almost wiped out by an inundation of the Theiss in 1879. Population, in 1890, 12,325; in 1900, 15,014.

DOR'PAT, formerly also written **DÖRPT** (Russian official name *Yuriev*, Esth. *Tartolin*, Lett. *Tehrpata*). A town in the Russian Government of Livonia, on the Embach, 163 miles southwest of Saint Petersburg (Map: Russia, C 3). The Domberg, situated at the northwest extremity of the town, was formerly occupied by a citadel, a cathedral, and a bishop's palace; it now is the site of an observatory, a library, and a number of buildings connected with the university. Dorpat has a number of Protestant churches, a town hall, a monument to Barclay de Tolly, a native of Dorpat, fine promenades, and a botanical garden. The town is protected by dikes from the overflowing of the Embach. Besides its famous university, Dorpat contains a teachers' seminary, a veterinary school, several gymnasia, and a number of scientific societies. In industrial importance Dorpat occupies in Livonia a position next to Riga. There are a number of manufacturing establishments, and the commerce is of considerable volume. The population, 42,421 in 1897, consisted principally of Esthonians and Germans, including also some Russians and Jews. The official language is Russian, but German is spoken by a large proportion of the inhabitants. Dorpat is believed to have been founded by Prince Yaroslav I. in 1030. With its capture by the Teutonic Knights in 1225 the town became the seat of a bishop and subsequently a commercial centre, and a member of the Hanseatic League. In 1559 it was captured by the Russians, who in 1582 ceded it to Poland. It was subsequently taken by the Swedes, the Poles, and the Russians. In 1704 it came into the permanent possession of Russia. In 1708 the Russians nearly destroyed the town and removed the inhabitants to the interior of Russia. Consult Hausmann, *Aus der Geschichte der Stadt Dorpat* (Dorpat, 1872).

DORPAT UNIVERSITY. See YURIEV UNIVERSITY.

DÖRPFELD, dērp'fēlt, WILHELM (1853—). A German archæologist. He was born at Barmen, and was educated at the Bauakademie, Berlin. From 1877 to 1881 he took part in the excavations at Olympia, becoming director of the technical operations there in 1878. In 1887 he was appointed secretary of the German Archæological Institute at Athens, with which institution he had for several years been associated as architect. He later occasionally coöperated with Schliemann (q.v.), and also undertook independent investigations in various parts of Greece. He was collaborator with Curtius and others on the work entitled *Ausgrabungen zu Olympia* (1877-81), and assisted Schliemann in the preparation of the publications *Troja* (1884) and *Tiryns* (1886). He wrote *Troja and Ilion* (2 vols., 1902).

DORR, JULIA CAROLINE RIPLEY (1825—). An American poet. She was born at Charleston, S. C., but early removed to New York and then to Rutland, Vt., where she married Hon. Seneca R. Dorr. She wrote much from her earliest years, but published nothing till 1848, when her verse and prose began to take a prominent place in American magazines. Among her books are: *Isabel Leslie* (1848); *Farmingdale* (1854); *Lanmere* (1856); *Sybil Huntingdon* (1869); *Expiation* (1872); *Bermuda* (1884), a volume of travel sketches; *The Flower of England's Face* (1895); *A Cathedral Pilgrimage* (1896); and *In Kings' Houses* (1898). She is best known, however, for volumes of thoughtful, artistic verse: *Poems* (1871); *Friar Anselm and Other Poems* (1879); *Daybreak: An Easter Poem* (1872); and *Afternoon Songs* (1885). A collected edition of her poems appeared in 1892.

DORR, THOMAS WILSON (1805-54). An American politician, famous as the leader of 'Dorr's Rebellion' in Rhode Island. He was born in Providence, R. I.; graduated at Harvard in 1823; studied law and was admitted to the bar; was a member of the State Assembly from 1833 to 1837, and soon became identified with the movement for an extension of the right of suffrage in the State. At that time Rhode Island's government was still based on the charter issued by Charles II. in 1663, and, by an act of 1798, the suffrage had been granted only to those who had a freehold valued at $134, or bringing an annual rental of $7. The apportionment of representatives, moreover, was unfairly made, Providence and Portsmouth, for instance, having the same number, though in 1840 the population of the former was twenty times as great as that of the latter. In 1840 a suffrage party was organized to effect the needed reforms. A constitutional convention, called by this party, met in October, and framed a constitution which, in December, was accepted by a large majority of the people. Meanwhile another constitutional convention, called by the Legislature, also adopted a constitution (in February, 1842), which, though liberal in character, was promptly rejected at the polls. In April the 'Suffragists' elected Dorr Governor, while the opposing party, or 'Landholders,' chose Samuel W. King, both of whom were formally inaugurated. Excitement on both sides soon ran high; and, in answer to a 'Suffragist' attempt to seize the arsenal at Providence, Governor King, on May 18, proclaimed martial law. Dorr made an effort to secure the support of the Federal authorities at Washington, but failed, and returned to Rhode Island, where his support soon collapsed. He then fled to Connecticut, but again returned, and was arrested, convicted of high treason, and, in June, 1844, sentenced to imprisonment for life. In 1847, however, he was released. Though the methods of Dorr were revolutionary and unwise, they served to attract general attention to the archaic and inequitable provisions of the State Constitution, and led to the adoption in November, 1842, of the present Constitution. By its provisions, and by amendments passed in 1888 and 1893, the suffrage has, at last, been made virtually universal. Consult: King, *The Life and Times of Thomas W. Dorr* (Boston, 1859); and a paper, "The Constitutional Controversy in Rhode Island in 1841," in the *Report of the American Historical Association for 1894* (Washington, 1895).

DOR'RIFORTH. A character in Mrs. Inchbald's *Simple Story;* originally a Roman Catholic priest, he wins the love of the heroine, Miss Milner, falls heir to a title, is absolved from his religious vows and marries her.

DOR'RIT, Amy. The unselfish heroine of Dickens's novel, *Little Dorrit.* She is the daughter of William Dorrit, an egotist lacking in moral fibre, whose long confinement for debt in Marshalsea Prison has gained him the sobriquet of 'the Father of the Marshalsea.' She was called Little Dorrit on account of her diminutive stature.

DORR'S REBELLION. See Dorr.

D'ORSAY, dôr'sâ', Alfred Guillaume Gabriel, Count (1801-1852). A French gentleman, famous chiefly as a leader of society in London and Paris. Through a morganatic marriage he was a grandson of the King of Württemberg, and belonged to a family prominent for its devotion to the Bonapartists. In December, 1827, he married Lady Harriet Gardiner, then fifteen years of age, the daughter of the English Earl of Blessington. The union was not happy, and was dissolved soon after Blessington's death, in 1829. From that time until his death, D'Orsay lived near the Countess of Blessington, and made her residence at Gore House the centre of the fashionable, artistic, and literary society of London. In 1849 the change of Government brought about their return to Paris, where D'Orsay painted a portrait of ex-King Jerome, executed busts of Lamartine and Prince Napoleon, and just before his death was appointed director of fine arts. He was tall and well built, was strikingly handsome, and was an excellent conversationalist, and for many years was regarded as an *arbiter elegantiarum* and the beau ideal of the fashionable gentleman. An accurate description of him is given by Disraeli in his novel *Henrietta Temple,* where D'Orsay appears as 'Count Mirabel.' Consult Madden, *Life of Lady Blessington* (London, 1855).

DORSE (Ger. *Dorsch,* haddock, Dan. *torsk,* Engl. also *torsk,* tusk). The Baltic cod (*Gadus callarias*), a variety of the common cod, found in the Baltic and the neighboring seas.

DOR'SET or **DOR'SETSHIRE** (from AS. *Dorsæte,* from *dor,* water, from OWelsh *dubr,* Welsh *dwfr,* Corn. *dofer, dour,* Ir. *dobar,* Gall. *dubron,* water + AS. *sæte,* settlers + *scire, scyre,* shire). A maritime county in the south of England, on the English Channel, between Devonshire and Hampshire (Map: England, D 6). It is an agricultural and stock-raising county, with an area of 988 square miles. Population, in 1891, 194,517; in 1901, 202,063. The county contains a number of valuable prehistoric ruins, the most noted of which is Maiden Castle, near Dorchester, which was probably erected many years before the Roman invasion. Many interesting relics of the Roman occupation have also been discovered. Capital, Dorchester.

DORSET, Earl of. See Sackville.

DOR'SEY, James Owen (1848-95). A distinguished American anthropologist, born in Baltimore, Md. After a course at the Theological Seminary of Virginia he was ordained a deacon in the Protestant Episcopal Church in 1871, and assigned to missionary work among the Ponca and Omaha Indians of South Dakota and Nebraska. Through his linguistic and sociologic studies among these tribes he was led to form a connection with the Bureau of American Ethnology, of which he continued an active and useful member until his death, devoting special attention to the Siouan tribes. His most important work is that upon the Dhegiha language, published under the auspices of the bureau, besides which he is the author of numerous contributions in bureau reports and other scientific publications.

DORSEY, Stephen Wallace (1842—). An American politician. He was born in Vermont, and removed in early life to Oberlin, Ohio. He served in the Union Army during the Civil War, rising to the rank of colonel of volunteers. In 1869, having been elected president of the Arkansas Central Railway, he removed to Arkansas, where he became prominent in reconstruction politics, and was chosen chairman of the Republican State Committee. In 1873, at the age of thirty-two, he was elected to the United States Senate by the almost unanimous vote of both the Democratic and Republicanic members of the State Legislature. He was a member of the Republican National Committee in 1872, 1876, and 1880, in the latter year serving as its secretary, and taking a prominent part in the campaign. He was implicated in the 'Star Route' frauds, but though indicted for conspiracy, escaped conviction. He attributed his indictment to persecution on the part of his political enemies. After 1880 he retired from politics.

DOR'SIVENTRAL'ITY (from Lat. *dorsum,* back + *venter,* belly). In plants, a term of symmetry, indicating that a structure has two dissimilar (dorsal and ventral) faces, which are differently related to the environment. For example, the thallus body of an ordinary liverwort, like Marchantia, is dorsiventral. It is prostrate, so that one surface (the dorsal) is exposed to the air and sunlight, and the other (the ventral) is in contact with the earth or other substance on which the plant grows. As a consequence of these different exposures, the two surfaces are not only unlike in appearance, but they give rise to different organs. In Marchantia, for example, the dorsal tissues, being exposed to light, develop chlorophyll, and the dorsal surface, being free, gives rise to the reproductive bodies; while the ventral surface puts out rhizoids (simple root-like structures) which penetrate the substratum and act as holdfasts and absorbing organs. Ordinary horizontal leaves are illustrations of dorsiventral organs, the two surfaces usually differing in appearance, and the dorsal and ventral tissues differing even more decidedly in their arrangement. For example, the dorsal (upper) epidermis of such a leaf is often made up of compact cells without stomata ('breathing pores'), and is covered by a well-developed cuticle; while the ventral (lower) surface contains multitudes of stomata and may be hairy. In such a leaf the dorsal working cells (mesophyll) are elongated and packed closely together to form 'palisade tissue,' while the ventral cells are loosely aggregated. These differences in structure are due to the character of the exposure, as is evidenced by the fact that if a very young dorsiventral leaf is fixed in an inverted position, the normally dorsal region will develop the ventral arrangement of tissues, and vice versa. Many underground stems, such as those of the common ferns and the ordinary rootstocks of seed-plants, are dorsiventral, giving rise to roots beneath and leaves or branches above. As contrasted with a dorsiventral structure, the 'radial structure' is one in which all sides are exposed alike, and such organs as are produced are repeated uniformly about the centre, as in an ordinary upright stem with its radially arranged leaves. See LEAF.

DORSTE'NIA. See CONTRAYERVA.

DORT. See DORDRECHT.

DORT, SYNOD OF. The largest and most important legislative council ever held by the Reformed Churches, the confessional outcome of which, the 'Canons of the Synod of Dort,' have binding doctrinal force upon the Reformed Dutch Churches. It was convened on November 13, 1618, dissolved May 9, 1619, and held 154 formal sessions. The language of the synod was Latin. Its expenses, amounting to over 100,000 guilders, were borne by the States-General of Holland, which convened it and invited all branches of the Reformed Church to participate. It consisted of 84 clerical and 18 secular delegates. Of these, 58 were Dutch, England sent 8, the Palatinate and Hesse 7, Switzerland 7, Bremen 3 delegates. Those appointed by Brandenburg were excused on account of age; those by the National Synod of France were forbidden by the King to leave the country. The sessions were public, and well attended. The ostensible object of the gathering was to compose doctrinal differences in the Church; its practical outcome was the condemnation of Arminianism as represented by the Remonstrants, defended by Barneveldt, Grotius, and most eloquently by Simon Episcopius; but opposed by the Government, headed by the Stadtholder, Prince Maurice of Nassau. The entire Dutch delegation were orthodox; Utrecht alone sent Arminian delegates, and they were not allowed to sit. The synod listened to the arguments of the Remonstrants, but was uninfluenced by them. On May 8, 1619, it was voted, Hesse and England alone dissenting, that the Arminians should be excluded by the synods and classes from their ecclesiastical places. This drastic order was subsequently ruthlessly executed. The canons adopted are rigorously Calvinistic, and cover the famous five points: (1) Divine Predestination; (2) Death of Christ [limited atonement]; (3) Corruption of Man; (4) Irresistible Grace; (5) Perseverance of the Saints. The Belgic Confession and the Heidelberg Catechism were also adopted, and a revision of the Dutch Bible from the Hebrew and Greek was ordered. The closing of the Synod of Dort was followed within a few days by the execution of Barneveldt, the victim of the jealousy and hatred of Maurice of Nassau. Consult Schaff, *Creeds of Christendom* vol. i.; and for text, id., vol. iii. (New York, 1884). See ARMINIUS; EPISCOPIUS; GOMARUS.

DORTMUND, dôrt'mųnt. One of the chief towns of the Prussian Province of Westphalia, and a notable mining centre, situated near the Emscher, about 73 miles northeast of Cologne (Map: Prussia, B 3). The city was formerly surrounded by a massive wall, but it has been removed and the site converted into handsome promenades. Four of its churches are worthy of notice—the Church of Saint Reinoldi, a fine specimen of the Transition period, dating from the thirteenth century; Saint Mary's, built about 1150, in the Romanesque style; Saint Peter's, completely restored; and the Roman Catholic parish church. The only secular building claiming especial attention is the weather-beaten Rathaus, dating from the thirteenth century. Public affairs are administered by a municipal council of forty-eight members and an executive board of sixteen. The municipal activity has in every way kept pace with the great increase of population since 1870. The educational institutions embrace two municipal gymnasia, an industrial school, numerous elementary schools, and a municipal theatre. The charitable institutions under municipal direction include the general hospital, an orphan asylum, and a day nursery. Dortmund is in the most fertile part of Westphalia, and is an important railway centre. Owing especially to its situation in the midst of the Westphalia coal-mining district, it has rapidly grown as an iron-manufacturing point, its leading industry being the manufacture of locomotives, cars, and various kinds of heavy machinery. There are flour and saw mills, and numerous breweries. Population, in 1890, 89,663; in 1900, 142,418; in 1905, 175,577.

The history of Dortmund goes back to 900. It became eventually a free Imperial city, and finally joined the Hanseatic League. It began to decline in the fifteenth century, and especially from the time of the Thirty Years' War. It has fully shared in the general modern prosperity of Prussia.

DO'RY, or **DORÉ**, dô-rā' (Fr. *dorée*, gilded, Lat. *deaurare*, to gild, from *de*, down + *aurum*, gold). (1) A local name about the upper Great

Lakes for the wall-eyed pike. (See Pike-Perch.) (2) See John Dory.

DORYPHORUS, dō-rĭf'ō-rŭs. See Athlete, The.

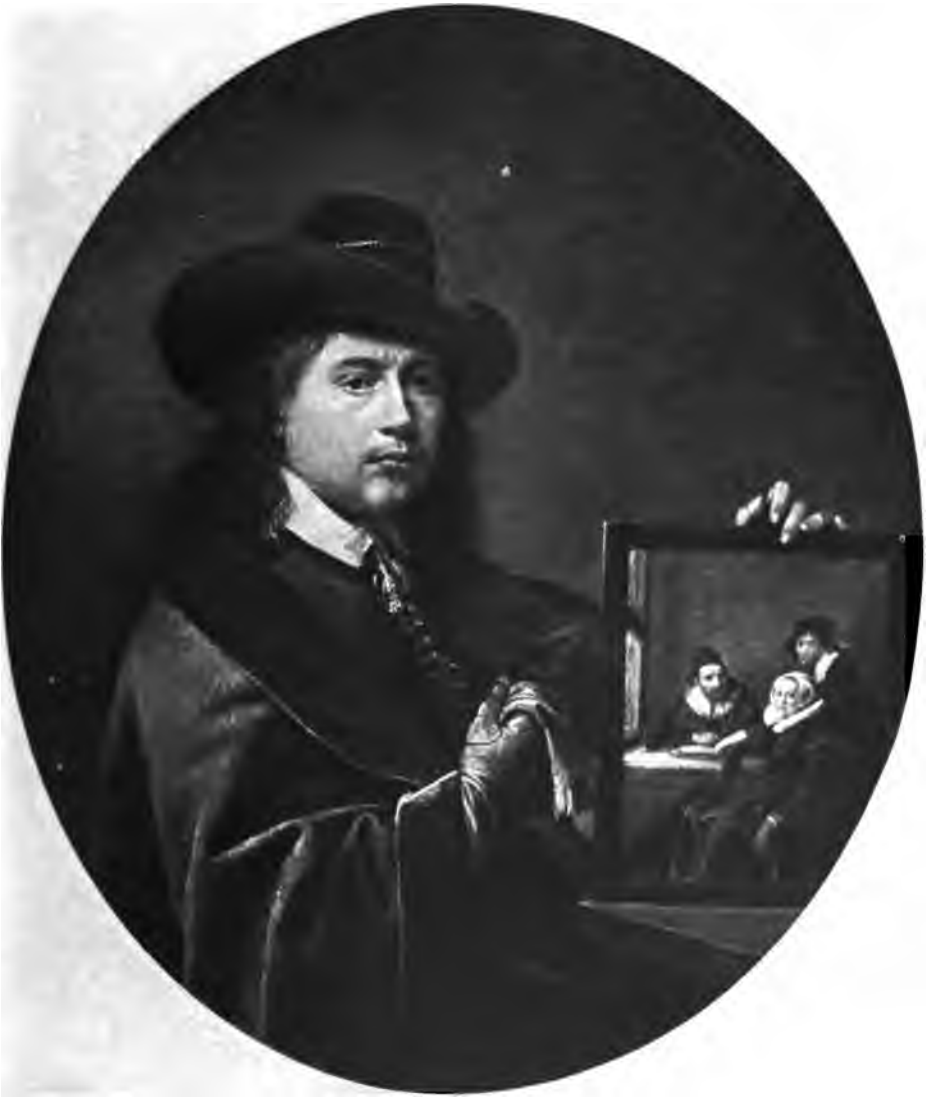
DOSITH'EANS. The followers of Dositheus, a Samaritan, contemporary with Jesus and the Apostles. According to Origen, he claimed to be the prophet mentioned in Deut. xviii. 18, and insisted on a curiously strict observance of the Sabbath. It is said that he starved to death in a cave. Other less trustworthy accounts connect Dositheus with John the Baptist or with Simon Magus. There were Dositheans in Egypt as late as the sixth century.

DOSITH'EUS (Lat., from Gk. Δωσίθεος), called Magister. A Greek grammarian and instructor of Roman students, belonging to the fourth century of the Christian Era. A work styled 'Ερμηνεύματα (*Commentaries*) was long erroneously attributed to him, because in some manuscripts it appeared in connection with his Latin grammar. Consult Krumbacher, *De Codicibus Quibus Interpretamenta Pseudo-dositheana Nobis Tradita Sunt* (Munich, 1883).

DOSSO DOSSI, dôs'sô dôs'sê, Giovanni di Niccolò Lutero (c.1475-1542). A celebrated Italian portrait and historical painter of the Ferrarese School, born in Ferrara. He and his brother Battista (?-1546) were probably both pupils of Lorenzo Costa—Giovanni, at any rate, was. The brothers painted together, Giovanni doing the figures and Battista—the inferior of the two—the backgrounds and accessories. Dosso is presumed to have visited Rome in his youth, and it is certain that both of them lived for some time in Venice, for they show the influence of the Venetian colorists. About 1512 Dosso was working for the Gonzagas at Modena, and still later he went to Trent with Battista; but, aside from these facts, little is known of the life of either. The poet Ariosto mentions them in *Orlando Furioso* with the highest praise. Dosso's works have often been disputed. It now seems certain that many of those hitherto attributed to Garofalo, Giorgione, and others are his. He does not seem to have left any drawings. As a colorist he ranks first among the Ferrarese painters, and his portraits may often be compared with Titian's. His subject pictures are also of great interest, for Dosso, along with a rich and glowing color, had a whimsical originality. The artificially pastoral spirit, of which the Italy of his day was full, appealed strongly to him, and the fantastic chivalry of the poetry of his friend Ariosto touched his imagination. One of his best pictures is "Circe in the Woods," in the Borghese Gallery, a work full of romance and mystery. Other notable pictures by him are: "Madonna with Saint Michael and Saint George," in the Modena Gallery; "Virgin Crowned by Angels" and "Saint John on Patmos," in the Ferrara Gallery; "Saint Sebastian," in the Brera at Milan; decorative paintings in the Ferrara Palace, consisting of "The Four Divisions of the Day" and three "Bacchanals"; and a number of works in the Dresden Gallery, which has more of the Dossi pictures than any other European museum outside of Italy. The landscapes in these pictures are often of great beauty, and are generally from the brush of Battista. Consult Morelli, *Critical Studies of Italian Painters*, translated by Ffoulkes (vol. ii., London, 1893).

DOST MOHAMMED KHAN, dôst mô-hăm'-mĕd kän (1793-1863). Ameer of Afghanistan from 1826 to 1863, and founder of the present reigning dynasty. He was a son of Poyndah Khan, an able man, prominent in the civil and military life of Afghanistan. To avenge the assassination of his eldest brother, Futteh Khan, at the behest of the Ameer Mahmud, Dost Mohammed and two of his brothers headed a rebellion, confined Mahmud to the Province of Herat, and divided the remainder of the country. Discord arose between the brothers, and Dost Mohammed, in 1826, made himself master of the country. Meanwhile Runjeet Singh, the Sikh Rajah, had occupied Peshawar, and Shah Sujah, who had been driven from the throne in 1809, had sought English aid to restore him to power. Dost Mohammed attempted to win the friendship of the Anglo-Indian Government; but that body rejected his advances and entered upon a costly course of blundering in regard to Afghan affairs. Captain Burnes was sent to Kabul in 1837, where the Ameer acknowledged frankly that, despairing of English support, he was looking toward Russia and Persia. At the same time he declared his wish to be on friendly terms with England. Meanwhile Lord Auckland, Governor-General of India, had adopted a policy of interference, and now undertook to restore Shah Sujah. In 1839 an Anglo-Indian army invaded Afghanistan and occupied Kabul, Shah Sujah being nominally placed on the throne, and in 1840 Dost Mohammed delivered himself up to the British. Thereupon the Afghan tribes rose under Akbar, the son of the captive Ameer. In January, 1842, the British army left Kabul to return to India, and was trapped in the Afghan defiles and annihilated. The advance of an army under General Pollock by way of the Khyber Pass enabled the British to recover from their defeat and overthrow Akbar; but Shah Sujah had been assassinated soon after the English left him at Kabul. In 1842 Dost Mohammed was allowed to return to his country and resume his uninterrupted reign. He assisted the Sikhs during their war with the British, but after the occupation of the Punjab he concluded a treaty with the Anglo-Indian Government in 1855. In 1863 Dost Mohammed added to his dominions the Province of Herat, which had remained independent since the expulsion of Mohammed from Kabul. He died May 29, 1863, having directed that his son Shere Ali (q.v.) should succeed him. Dost Mohammed had a certain rugged barbaric honesty not always found in Oriental princes. In spite of his hard experience with the Anglo-Indian Government, he always leaned to the English side in the frontier politics which involved Russia, Persia, Great Britain, and Afghanistan. He showed statesmanlike qualities in external and internal affairs, and brought a measure of order into the Afghan chaos. Consult Mohan Lal, *Life of the Amir Dost Momammed, Khan of Kabul* (London, 1846). See Afghanistan.

DOSTOYEVSKI, dŏs'tô-yĕf'skê, Fyódor Mikháylovitch (1821-81). A Russian novelist, the son of a Moscow physician. A graduate of the Saint Petersburg School of Engineering, he obtained a position in the Department of Engineers



GERARD DOW

PORTRAIT OF HIMSELF, FROM THE PAINTING IN THE DUCAL MUSEUM, BRUNSWICK

in 1843, but soon gave it up (1844) for literary pursuits, making his début with *Poor People* (1846). A number of other sketches followed; but in 1849, for his connection with the revolutionary plot of Petrashevski, he was condemned to death, but on the scaffold this sentence was commuted to hard labor in Siberia. During the years in prison, he gave way to religious mysticism. Pardoned in 1855 by Alexander II., he resumed his literary activity at Saint Petersburg in *The Downtrodden and Oppressed*, his first long novel, in the new magazine, *Vremya* (*The Time*), published in conjunction with his brother. This was followed by *Memoirs from a Dead House* (1861-62), wherein were related his own experiences in prison. He now became an ardent Slavophile and mystic, with a tendency toward absolutism, and his *Crime and Punishment* (1866) marked his break with the liberals and radicals. In his periodical, in his *Author's Diary*, in his *The Brothers Karamazoff* (1879-80, unfinished), and other works, these new tendencies were carried still further. The liberals were almost reconciled with him after his famous speech at the banquet on the occasion of the unveiling of Pushkin's monument at Moscow in 1880.

His works are seriously deficient from the purely technical point of view, the language is rarely polished, and he lacks a sense of proportion. His power of psychological analysis, however, especially of pathological conditions, aided as he was in this by his complete self-identification with the lowly and degraded characters depicted, has nothing similar in all the range of universal literature. The accuracy and the scientific value of his pictures are fully attested by great Russian criminologists. The last edition of his works, in twelve volumes (Saint Petersburg, 1892), contains a biographical sketch by K. K. Slushevski. English translations of the following works have appeared: *Crime and Punishment* (New York, 1886); *Poor Folk* (London, 1894); *Prison Life in Siberia* (London, 1886); *Idiot* (London, 1887); *Uncle's Dream* and *The Permanent Husband* (London, 1888). Consult: Brandes, *Dostojewsky* (Berlin, 1889); Hoffmann, *T. M. Dostojewsky* (Berlin, 1899); and Koni, "Dostoïevsky criminaliste," in *Revue Internationale de Sociologie* (Paris, 1898).

DOT. See Peerybingle, Mrs.

DO'TARD (so called from alleged stupidity). A name formerly applied by sailors to various Arctic seals, especially in Newfoundland, and to a young harbor seal (*Phoca vitulina*).

DOTHAN. A city and county-seat of Houston County, Ala., 119 miles from Montgomery, on the Atlantic Coast Line, the Central of Georgia, and other railroads (Map: Alabama, D 4). It is an important commercial centre for that section of the state and has fertilizer, ice, and lumber-mills. It has several handsome public buildings, and a public library. First settled about 1885, its government, under a revised charter of 1901, is vested in a mayor, elected biennially, and a council of five members. Population, 1900, 3275; 1906 (local est.), 8000.

DOTHEBOYS (d͞oo'the-boiz) **HALL.** A Yorkshire school kept by one Squeers, in Dickens's *Nicholas Nickleby*, where Nicholas was assistant for a time—a picture of abuses in the country boarding-school system. The caricature was efficacious in causing the abolition of many similar educational horrors of Dickens's time.

DOT'TEREL (OE. *dotrelle*, little doll, from *dotien*, to be stupid, Dutch, *dutten*, Icel. *dotta*, to nod from sleep). A reddish plover (*Endromias morinellus*), which in summer inhabits the northern parts of Europe and Asia, breeding chiefly in the highest latitudes, and migrates on the approach of winter to the countries around the Mediterranean and those of similar climate. It appears in Great Britain as a bird of passage, but is now almost extinct, owing to the incessant shooting of it in spring, and the taking of its eggs.

DOU, DOW, or **DOUW,** Gerard (1613-75). A Dutch genre painter, born at Leyden in April, 1613. His father apprenticed him first to an engraver and later to Pieter Kouwenhooven, a painter on glass, but Dou's real master was Rembrandt, with whom he studied and to whom he was indebted for his skill in chiaro-scuro. He first devoted himself to portrait painting, in which he achieved great success; good examples are his two portraits of himself and of Rembrandt's mother in the Dresden Gallery. But genre subjects were better fitted to display his genius, and he excelled in simple domestic scenes, painted with infinite attention to detail. He would depict a broomstick or a pan of vegetables with as much carefulness as the figures that were introduced. It is said that he not only prepared his own brushes, and pounded his colors, but worked with his own hands at everything required in the construction of a picture. Dou often painted with charming effect the artificial light produced by candle or lantern. His picture "The Evening School" (Ryks Museum, Amsterdam) is the best example of the candle-light effect.

Among his chief works are the "Woman Sick of the Dropsy" (1663), "The Bible Reader," and the "Grocer Woman," in the Louvre; the "Girl at the Window," the "Schoolmaster," and the "Hermit," and others at Dresden; a "Portrait of Dou's Wife," and the "Poulterer's Shop," in the National Gallery. He painted upward of two hundred works. His style was tender and delightful, and his beautiful coloring enriched the simplest domestic scene. He is one of the most important Dutch genre painters—the so-called "Little Dutchmen." Among his pupils were Franz van Mieris, Gabriel Metsu, and Slingeland. Consult: Van Dyke, *Old Dutch and Flemish Masters* (New York, 1895); Kugler, *German, Flemish, and Dutch Schools* (London, 1898); Martin, *Gerard Douw* (New York, 1902).

DOUAI, or **DOUAY,** d͞oo'ȧ. A town of France, in the Department of Nord, situated on the River Scarpe, about 20 miles south of Lille. Among the manufacturing establishments are salt and sugar refineries, breweries, and file factories, and there is an active trade in corn, seed, and linen. The town possesses a library of 87,000 volumes and a scientific and archæological museum. Population, 1901, 33,649. It was held by the dukes of Burgundy after 1384, from whom it passed into the possession of the Hapsburgs. It was taken by Louis XIV. in 1667, lost in 1710, and retaken in 1712. Douai was the seat of a celebrated seminary for English Catholics, founded by Cardinal Allen in 1568. It was formerly also the seat of a Catholic university. An English

Benedictine seminary exists here. For the Douai Bible, see BIBLE.

DOUARNENEZ, dwär'ne-nä′ (Bret., Land of the Isle, alluding to the island of Tristan opposite). A seaport of Brittany, France, on a bay of the same name in the Department of Finistère (Map: France, B 3). It has some ship-building and extensive sardine fisheries. Population, in 1901, 12,865.

DOUAY. See DOUAI.

DOUAY, FÉLIX CHARLES (1816-79). A French general. He served in the wars in the Crimea, in Italy, and in Mexico, and for bravery at Magenta and Solferino he was made a brigadier-general. In the Franco-German War he led the Seventh Army Corps, and he was taken prisoner at Sedan. As commander of the Fourth Army Corps, organized against the Communes, he was the first to enter Paris (May 22, 1871), and saved the Louvre from entire destruction.

DOUBAN, d͞oo-bän′. (1) A physician in *The Greek King and Douban the Physician*, one of the stories in *The Arabian Nights*. About to be executed by the ungrateful monarch, whom he had cured, he gives him a book with poisoned leaves, telling him to consult the sixth page. The King puts his finger to his lips to facilitate turning over the pages, the poison enters his system, and he dies. (2) A physician and slave who ministers to Wisel, at the command of the Emperor Alexis, in Scott's *Count Robert of Paris*.

DOUBLE-BASS. The largest instrument of the violin family in common use. The double-bass is the foundation of the orchestra, for to it is given the lowest part of the harmony. It probably received its name because it often doubles in the lower octave the bass of the harmony given to the bassoon, violoncello, or some other instrument. Not before the beginning of the nineteenth century were independent parts assigned to this instrument. It appears first about the beginning of the seventeenth century. Its origin is attributed to Gaspar di Salo in 1580, but he may have only added improvements to an instrument that already existed. The double-bass was first used in the orchestra about 1696. It was originally mounted with three strings, but is now used with four strings tuned in E_1, A_1, D, and G, and the notes sound an octave lower than written. Its compass is from E_1 to a. The double-bass is an orchestral rather than solo instrument, but a few persons have excelled as virtuosi upon it, e.g. Dragonetti (1763-1846) and Bottesini (q.v.). The instrument is sometimes called a contrabass.

DOUBLE COCOANUT. See SEYCHELLES COCOANUT.

DOUBLE CONSCIOUSNESS. A morbid mental condition, also known as double personality, observed in cases of hysteria, hypnosis, and trance, characterized by the existence of two or more independent, self-consistent groups of conscious processes which alternate periodically, or are called up in irregular sequence as favorable circumstances arise. Usually these groups are strictly separated from one another, so that, while one group is in operation, the other is utterly shut out from consciousness; a fact which, from the purely psychological point of view, stamps the phenomenon as an instance of general derangement of memory. When the two sets of ideas become complex, and the mutual obliviscence is complete, each group develops that 'aura' of sensations and feelings which constitutes selfhood; and the individual whose mind is thus partitioned may be rightly said to possess a 'double' or 'secondary personality.' When this division of mentation is radical, there is oftentimes exhibited a curious antithesis between the types of the two personalities, a condition popularly set forth, in an exaggerated degree, in Stevenson's *Dr. Jekyll and Mr. Hyde.*

The ultimate basis of double consciousness must be sought in certain physiological conditions of the central nervous system. Partial light is thrown upon the conditions which favor the mental schism by the frequent demarcation of the two 'selves' by specific antithetical moods. This feature makes it probable that the organic sensations, the chief determinants of our general mood or temper, may constitute the nucleus around which are gathered the remaining elements of the segregated 'personality.' This function of the somatic elements of consciousness is well illustrated in Flournoy's study of a remarkable case of divided consciousness, that of the medium 'Mlle. Smith,' who 'incarnates' several distinct personalities, and whose 'guiding spirit' has his origin, in Flournoy's judgment, in the sexual cœnæsthesis of the subject herself.

Finally, double consciousness may be regarded as, in a certain sense, merely an exaggeration of what is termed 'motor automatism,' a condition which is often present, or at least easily developed, in the normal consciousness. Solomons and Stein have shown experimentally that there exists "a complete analogy between the performances of the second personality and the automatic acts of normal persons." They were able, by practice, to cultivate automatisms of a complicated nature, such as spontaneous automatic writing and reading. If, e.g., A reads aloud to B, who simultaneously dictates to A, and the reading is sufficiently interesting, B will unconsciously dictate sentences which A unconsciously writes. It remains to be added that hypnosis furnishes excellent examples of the alternation of consciousnesses. Subjects who, when awakened, are totally ignorant of their hypnotic experiences, may, in a succeeding hypnosis, return without break to the consciousness of the former somnambulistic state. Consult: Flournoy, *From India to the Planet Mars* (New York, 1900); Kuelpe, *Outlines of Psychology*, trans. by Titchener (London, 1895); Wundt, *Lectures on Human and Animal Psychology*, trans. by Creighton and Titchener (London, 1896); Dessir, *Das Doppel-Ich* (Leipzig, 1889); Janet, *L'automatisme psychologique* (Paris, 1891).

DOUBLE COUNTERPOINT. See COUNTERPOINT.

DOUB'LEDAY, ABNER (1819-93). An American soldier. He was born at Ballston Spa, N. Y.; graduated at West Point and was assigned as brevet second lieutenant of artillery in 1842. He served in the First Artillery during the Mexican War, and participated in the battles of Monterey and Buena Vista. He was stationed at Fort Moultrie at the breaking out of the Civil War and took part in the defense of Fort Sumter. A month later he was promoted major, and served with

General Patterson in the Shenandoah Valley, and on February 3, 1862, he was made a brigadier-general of volunteers and placed in command of the defenses of Washington. He commanded a division at the second battle of Bull Run and at Antietam. He became a major-general in November, 1862; fought at Fredericksburg, Chancellorsville, and at Gettysburg, where on the first day of the battle, on the fall of General Reynolds, he commanded the troops in the field for several hours. He continued to serve (as colonel in the Thirty-fifth Infantry) in the regular army after the war, but retired in 1873. He published *Reminiscences of Forts Sumter and Moultrie in 1860-61* (1876); and *Chancellorsville and Gettysburg* (1882), in the "Campaigns of the Civil War Series."

DOUBLE DRAGON, Order of the. A Chinese military order with five grades. It was established in 1865 for the purpose of rewarding European officers who had been of service to China, but was extended to other classes in 1882.

DOUBLE EYE, or Four-Eyes. See Anableps.

DOUBLE FLAT. See Musical Notation.

DOUBLE FLOWER. See Flower.

DOUBLE FUGUE, fūg. See Fugue.

DOUBLE MARRIAGE, The. A tragedy by Fletcher and Massinger (1619), printed in 1647. It deals with the enforced marriage to Martia of Virolet, already Juliana's husband, in order that he may escape from prison and further the cause of Neapolitan freedom. He is finally killed by his first wife, who mistakes him for Ronvere, whose dress he has assumed.

DOUBLE NATURAL. See Musical Notation.

DOUBLE REFRACTION. See Light.

DOUBLE SHARP. See Musical Notation.

DOUBLE STARS. As seen by the naked eye all stars appear to be single, but the telescope shows us that many are double, while it resolves others into several distinct bodies. In some instances telescopes of low power suffice to reveal the separation; others require instruments of the largest kind. It is not possible to decide by a single observation whether these stars are 'optical' doubles, of which the two components are merely projected upon contiguous points of the sky, or true 'binary' systems, whose components are really near each other in space. But if the lapse of time reveals to observers an orbital motion of the components, it is safe to assume that we have to deal with a pair of stars physically connected—a double star, as it were. About 10,000 double stars are known, and of these some 250 are almost certainly binary. Their periods of revolution range from five and a half years up to perhaps ten centuries.

In addition to these optical doubles and binary systems observed visually with the telescope, astronomers have discovered a number of so-called 'spectroscopic' binaries. These have an orbital revolution which is often extremely short, and the components are so near together that they cannot be separated in the ordinary way by the most powerful telescopes. But a study of their spectra reveals a duplication of the spectral lines, explicable only on the theory that we have to do with a double source of light. Periodicity in this duplication then allows the observational determination of the time of orbital revolution in the double system. See Stars.

DOUBLET (from *double;* cf. OF. *doublier, doublour,* lining of a garment; so called from being originally lined or wadded for defense). A close, tight-fitting garment, the skirts reaching a little below the girdle. It was almost identical with what was afterwards called the jerkin, which, as a matter of strict chronology, belongs rather to the sixteenth and seventeenth centuries. The sleeves were sometimes separate, and tied on the arm. See Costume.

DOUBLET. An imitation gem, usually made by cementing a thin layer of a genuine gem by means of a colorless gum, such as mastic, on the line of the girdle, to a piece of glass that has been colored to imitate the real gem. See Gems, Imitation and Artificial.

DOUBS, dōō (ancient, *Dubis*). An eastern department of France, separated from Switzerland by the Jura Mountains (Map: France, N 4). Area, 2030 square miles. Population, in 1891, 302,046; in 1901, 298,864. Doubs is traversed by the river Doubs, a tributary of the Saône. The surface is hilly, being crossed by four parallel ranges of the Jura Mountains. The climate is more rigorous than in most similar latitudes. Pine, walnut, and common orchard trees thrive well; mines of iron and coal are worked; and gypsum and marble are abundant. The trade is principally in iron, cattle, horses, and dairy products. Capital, Besançon. The department was formed out of part of the old Franche-Comté.

DOUBTING CASTLE. In Bunyan's *Pilgrim's Progress,* the dwelling of Giant Despair, in which Christian and Hopeful are temporarily imprisoned. They escape by using the key 'Promise.'

DOUBTING INSANITY. A form of melancholia (q.v.).

DOUC, dōōk (Fr. *douc,* of uncertain etymology). A small monkey (*Semnopithecus nemæus*) of Cochin-China, curiously variegated with black, white, and red. It is nearly related to the hanuman (q.v.).

DOUCET, dōō'sâ', Charles Camille (1812-95). A French dramatist, born in Paris. He wrote *Léonce* (1838) in collaboration with Bayard, and the play was followed by several comedies in verse. These have been collected and published under the title *Comédies en vers* (1858). The most successful of his plays was *La considération* (1860). He was elected a member of the Academy in 1865, and in 1871 was made its perpetual secretary.

DOUCET, Henri Lucien (1856—). A French figure and portrait painter. He was born in Paris, and studied there under Lefebvre and Boulanger. In 1878 he exhibited his portrait of Monsieur R. Julian, which was highly praised, and in 1880 he won the Prix de Rome. The portrait of Mme. Galli Marie as Carmen (1884), in the Marseilles Museum, is technically a brilliant work. His pictures are usually piquant, sparkling representations of modern life, eminently Parisian in style: and his portraits in pastel also are notable. His most widely known work is "Après le bal" ("After the Ball," 1889). He was awarded a first class medal for pastel in

1889, and the decoration of the Legion of Honor in 1891.

DOUCHE, do͞osh. See BATH; HYDROTHERAPY.

DOUGALL, do͞o′gal, LILY (1858—). A Canadian novelist, born in Montreal. She completed her education at the universities of Edinburgh and Saint Andrews, and passed much of her time at Melbourne, in Derbyshire, England. The scope of her work extends from Canadian themes to a portrait of the new woman. Among her popular novels are: *Beggars All* (1891); *What Necessity Knows* (1893); *The Mermaid* (1895); *The Madonna of a Day* (1896); *A Dozen Ways of Love* (1897); and *The Mormon Prophet* (1899).

DOUGHFACE. A contemptuous nickname applied before the Civil War to any Northern man who was accused of truckling to the slave power. Lowell explains the term in his glossary to the *Biglow Papers* as meaning "a contented lickspittle, a common variety of Northern politicians," and makes his 'pious editor' say:

> For any office, small or gret,
> I couldn't ax with no face,
> 'uthout I'd ben, thru dry an' wet
> Th' unrizzest kind o' doughface."
> *Works*, viii. 102.

The term was probably first used in this connection by John Randolph of Roanoke, who, in 1820, referred to the eighteen Northern Congressmen who had supported the Missouri Compromise as 'Northern doughfaces.'

DOUGHTY, dŏ′tĭ, or dou′tĭ, CHARLES MONTAGU (1843—). An English explorer. He was born at Theberton Hall, Suffolk, and was educated at Cambridge. During a sojourn of two years in Arabia he made a valuable study of the geography, archæology, and ethnography of the country, the results of which were afterwards embodied in the work entitled *Travels in Arabia Deserta* (1888).

DOUGHTY, THOMAS (1793-1856). An American landscape painter, born in Philadelphia, Pa. He had hardly any instruction in art, though he studied for a time in London and Paris, and attracted favorable attention abroad. His works now possess little except an historic interest, but it must not be forgotten that landscape painting was then in its infancy in this country, and Doughty was one of the first to show an appreciation of its possibilities. The colors in his pictures are never crude, and he has a delicacy of tone rare in his day. The Edinburgh Museum has "A View of the Schuylkill" by him, and there are five works of his in the Pennsylvania Academy of Fine Arts in Philadelphia.

DOUGLAS, dŭg′las (Ir. *Dubh-ghlaise*, black stream). The capital and principal seaport of the Isle of Man, situated on the margin of a highly picturesque bay on the east side of the island (Map: England, B 2). It has become an important watering-place. The old town, standing on the southwestern edge of the bay, has narrow, tortuous streets, and presents a vivid contrast to the handsome modern terraces and villas which occupy the rising ground beyond. A handsome promenade skirts the edge of the bay. The tower of refuge, a picturesque object, occupies a dangerous rock, in the southern area of the bay, called Conister, and was erected in 1833 for the safety of shipwrecked mariners. Douglas was incorporated in 1895, and since that date much has been done by the authorities to promote the prosperity of the town. The water-supply has been municipalized; many improvements in streets, promenades, etc., have been carried out; new municipal buildings and artisans' dwellings have been erected. The town maintains a public library, markets, and slaughter-houses. Douglas is the principal packet station of the island and is in steamship communication with Liverpool, Belfast, Dublin, and Glasgow. Population, in 1901, 19,223.

DOUGLAS, FAMILY OF. A family of great prominence in the history of Scotland. The legend of the sixteenth or seventeenth century, attributing its rise to the bravery of Sholto Douglas in 770, is impossible from the details of the legend itself. Nor can any connection be traced, as Chalmers supposed there could be, between the Douglases and the Fleming Theobald, who held the lands on Douglas water from 1147 to 1164.

WILLIAM OF DOUGLAS appears as a witness of charters in 1175 and 1213. He was doubtless so called from the vale of Douglas, in Lanark, which he held. His son Bruce was made Bishop of Murray in 1203. SIR ARCHIBALD or ERKENBALD OF DOUGLAS, who appears in charters between 1190 and 1232, was the first of the family to attain the rank of knighthood. Besides the family inheritance, he held land under the monks of Dunfermline and the Earl of Fife, and in Clydesdale through his wife, one of the heiresses of Sir John Crawford. His son, SIR WILLIAM, figures in charters from 1240 to 1273, and appears in 1255 as a Scottish partisan of Henry III. of England in the baronial wars, and was granted the manor of Faudon in Northumberland by the future Edward I. His son, SIR HUGH, died in 1287, and was succeeded by his brother, WILLIAM THE HARDY, as he is called in family traditions, a daring and restless man. He was the first man of influence to join Wallace in his rising against the English, but soon deserted him, submitting to his old patron, King Edward I., to whom he had again and again sworn fealty. He was sent prisoner to the Tower of London, where he died in 1298. It appears that he possessed lands in one English and in seven Scottish counties—Northumberland, Berwick, Edinburgh, Fife, Lanark, Ayr, Dumfries, and Wigton.

The history of his son, the GOOD SIR JAMES OF DOUGLAS, is familiar to every one, as Bruce's greatest captain in the long War of the Succession. The hero of seventy fights, he is said to have won them all but thirteen, leaving the name of the 'Black Douglas'—so he was called from his swarthy complexion—as a word of fear by which English mothers stilled their children. He was slain in Andalusia, in 1330, on his way to the Holy Land with the heart of his royal master, and was succeeded by his son, WILLIAM, LORD OF DOUGLAS, who was slain at Halidon in 1333. SIR ARCHIBALD L. DOUGLAS (1296-1333), a younger brother of the Good Sir James, was a prominent Scottish leader during the minority of David II. In 1332 he surprised and defeated Edward de Baliol, the rival claimant of the throne. He was made Regent of Scotland in 1333, and in the same year invaded England, but was defeated and slain at Halidon. In 1357 SIR WILLIAM OF DOUGLAS, son of the Regent of Scotland, who had fought at Poitiers and distinguished himself in other fields, was made Earl of Douglas, and afterwards, by marriage, became Earl of Mar. In 1371 he even disputed the succession of the Scottish crown with Robert II., the first of the Stuarts, which he claimed as a descendant of the Baliols and Comyns. His pretensions were abandoned only on condition that his son should marry the King's daughter. He died in 1384. His son, **James**, second Earl of Douglas and Mar, the conqueror of Hotspur (q.v.), fell at Otterburn in 1388; and, as he left no legitimate issue, the direct male line of William the Hardy and the Good Sir James now came to an end.

The earldom of Douglas, meanwhile, was bestowed on an illegitimate son of the Good Sir James—**Archibald**, Lord of Galloway, surnamed the Grim. By his marriage with the heiress of Bothwell he added that barony to the Douglas domains; and, having married his only daughter to the heir apparent of the Scottish crown, and his eldest son to the eldest daughter of the Scottish King, he died in 1400 or 1401. His son and successor, **Archibald**, fourth Earl of Douglas, was, from his many misfortunes in battle, surnamed 'the Tyneman'—i.e. the loser. He was taken prisoner at Homildon (1402), and at Shrewsbury in the following year. Repairing to France, he was there made Duke of Touraine, and fell at Verneuil in 1424. He was succeeded by his son **Archibald**, who distinguished himself in the French wars, and, dying in 1439, was buried in the Church of Douglas, where his tomb still remains. His son and successor, **William**, a boy of sixteen, by the splendor of his court aroused the fear of the Scottish King, and was treacherously beheaded in Edinburgh Castle in 1440. His French duchy and county died with him; his Scottish earldom was bestowed on his granduncle (the second son of Archibald the Grim), **James**, surnamed the Gross, who in 1437 had been made Earl of Avondale. He died in 1443, being succeeded by his son **William**, who, by marriage with his kinswoman (the only daughter of Archibald, fifth Earl of Douglas, and second Duke of Touraine), again added the lordship of Galloway to the Douglas possessions. He was for a time all-powerful with King James II., who made him lieutenant-general of the realm; but afterwards losing the royal favor, he seems to have entered into a confederacy against the King, by whom he was killed in Stirling Castle in 1452. Leaving no child, he was succeeded by his brother **James**, who in 1454 made open war against King James II. as the murderer of his brother and kinsman (the sixth and eighth Earls of Douglas). The issue seemed doubtful for a time; but the Hamiltons and others being gained over to the King's side, Douglas fled to England. The struggle was still maintained by his brothers—Archibald, who by marriage had become Earl of Murray, and Hugh, who, in 1445, had been made Earl of Ormond. They were defeated at Arkinholm in May, 1455, Murray being slain on the field and Ormond taken prisoner and afterwards beheaded. Abercorn, Douglas, Strathaven, Thrieve, and other castles of the Douglases, were dismantled, and the earldom of Douglas came to an end by forfeiture, after an existence of ninety-eight years, during which it had been held by no fewer than nine lords. The last Earl lived many years in England, where he had a pension from the Crown and was made a Knight of the Garter. In 1484 he leagued himself with the exiled Duke of Albany to invade Scotland. He was defeated at Lochmaben, but James III. spared his life on condition of his taking the cowl. He died in the Abbey of Lindores in April, 1488; and so ended the elder illegitimate line of the Douglases.

Earls of Angus. This line was begun with **George**, the illegitimate son of William, first Earl of Douglas, and Margaret Stewart, Countess of Angus and Mar. He received a grant of his mother's earldom of Angus in 1389, married in 1397 the youngest daughter of King Robert II., was taken prisoner at Homildon in 1402, and died of the plague in England in the following year. He was succeeded by his son **William**, who, dying in 1437, was succeeded by his son **James**, who died without issue, when the title reverted to his uncle. **George**, fourth Earl of Angus, took part with the King against the Douglases in 1454; his loyalty was rewarded by a grant of their old inheritance of Douglas-dale; and so, in the phrase of the time, "the Red Douglas"—such was the complexion of Angus—"put down the Black." He died in 1462, being succeeded by his son **Archibald**, surnamed Bell-the-Cat, and sometimes also called the Great Earl. After filling the highest offices in the State, and adding largely to the family possessions, he retired to the Priory of Canons Regular at Whithorn, in Galloway, where he died about 1514. He was succeeded by his grandson **Archibald**, who, in 1514, married the Queen Dowager of Scotland, Margaret, sister of Henry VIII. of England and widow of James IV. of Scotland. The fruit of this marriage was a daughter, Margaret, who, marrying the Earl of Lennox, became the mother of Henry, Lord Darnley, the husband of Queen Mary and father of King James VI. The Earl of Angus had for a time supreme power in Scotland; but in 1528 the young King James V. escaped from his hands, and sentence of forfeiture was passed against Angus and his kinsmen. The King swore that while he lived the Douglases should have no place in his kingdom; and he kept his vow. On his death, in 1542, Angus returned to Scotland, and was restored to his honors and possessions. He died at Tantallon in 1556. His nephew, who succeeded him, died two years afterwards, leaving an only son, **Archibald**, eighth Earl of Angus. This Good Earl, as he was called, died in 1588, when his title devolved on his kinsman **William**, the grandson of Sir William Douglas of Glenbervie, second son of Archibald Bell-the-Cat. Dying in 1591, he was succeeded by his son **William**, who next year obtained from the Crown a special recognition of his high privileges as Earl of Angus. He turned Roman Catholic, and died in Paris in 1611.

Marquises and Dukes of Douglas, and Lords Douglas. **William**, eleventh Earl of Angus, was created Marquis of Douglas in 1633, and, dying in 1660, was succeeded by his grandson **James**, who died in 1700, leaving issue one son and one daughter. The son, **Archibald**, third Marquis of Douglas, was created Duke of Douglas in 1703, and died childless in 1761, when his dukedom became extinct and his marquisate devolved on the Duke of Hamilton. The descendants of his sister, Lady Jane Douglas, were British peers, under the title Baron Douglas of Douglas Castle, from 1790 till 1857. The claims of the rivals to the earldom of Angus in 1762 were never decided, and the title is still in abeyance. The right attached to it of bearing the crown of Scotland was debated before the Privy Council in 1823, when it was ruled that Lord Douglas's claim to that honor, being a claim of heritable right, fell for decision to a court of law. The motto of the Douglas arms, *Jamais arrière* ('Never behind'), probably alludes to the peculiar precedence inherent in their earldom of Angus. The bloody heart commemorates Bruce's dying bequest to the Good Sir James; the three stars which the Douglases bear in common with the Murrays seem to denote the descent of both from one ancestor.

EARLS OF MORTON. SIR ANDREW OF DOUGLAS, who appears in record in 1248, was apparently a younger son of Sir Archibald, or Erkenbald, of Douglas, the second chief of the house. His son, WILLIAM OF DOUGLAS, swore fealty to King Edward I. for his lands in West Lothian in 1296, and was probably the father of Sir James of Douglas—surnamed the Lothian, to distinguish him from his kinsman of Clydesdale—who, in 1315, had a grant from Bruce of the lands of Kincavil and Calder-clere. He died about 1320, being succeeded by his son, SIR WILLIAM OF DOUGLAS, of Liddesdale, who greatly enlarged the family possessions in Fife and elsewhere. The 'Knight of Liddesdale'—as he was called by his contemporaries, who regarded him as 'the flower of chivalry'—was assassinated in 1353 by his kinsman, William, first Earl of Douglas, to revenge his wife's dishonor. He was succeeded by his nephew, SIR JAMES OF DOUGLAS, of Dalkeith, a man of literary tastes, who entertained Froissart at his board and possessed a valuable library for the day. He was of great power and influence, and contracted princely alliances. His first wife was a daughter of 'Black Agnes,' the heroic Countess of Dunbar; his second was a sister of King Robert II.; and he matched his eldest son, Sir James of Douglas, of Dalkeith, with a daughter of King Robert III. Their grandson married a daughter of King James I., and in 1458 was created Earl of Morton. His grandson, the third Earl, dying without male issue in 1553, the earldom devolved on his daughter's husband, the Regent Morton, JAMES DOUGLAS, great-grandson of Archibald Bell-the-Cat. After his fall the title went to ARCHIBALD, eighth Earl of Angus; and when he died childless, in 1588, it passed to SIR WILLIAM DOUGLAS, of Lochleven, who thus became seventh Earl of Morton. His losses in the great Civil War compelled him, in 1642, to sell Dalkeith to the Earl of Buccleuch, and his Tweeddale and Eskdale lands to others; but Aberdour and other old domains of the family still remain with his descendant, the Earl of Morton, who descends legitimately in the male line from William of Douglas, the progenitor of the race in the twelfth century.

OTHER BRANCHES. In the seventeenth century the descendants of Sir William Douglas of Drumlanrig, an illegitimate son of the hero of Otterburn, were created earls, marquises, and dukes of Queensberry, earls of March, and earls of Solway, of which titles only that of the Marquis of Queensberry remains in the family. During the same period younger branches of the family were earls of Selkirk, Forfar, and Dumbarton, and held other titles, of which that of the Earl of Selkirk is the only one not now dormant or extinct.

BIBLIOGRAPHY. Hume of Godscroft, *A History of the House of Douglas and Angus* (Edinburgh, 1644; reprinted 1748), preserves the traditions of the family, but its accuracy is not to be trusted. The earlier history of the Douglases has been critically examined by Chalmers in his *Caledonia*, vol. i. (London, 1807); by Riddell in his *Remarks upon Scotch Peerage Law* (Edinburgh, 1833); by Cosmo Innes, in the *Registrum Episcopatus Moraviensis* (Edinburgh, 1837), and the *Liber S. Marie de Calchou*, vol. i. (Edinburgh, 1846); and by Joseph Roberston, in the *Origines Parochiales Scotiæ*, vol. i. (Edinburgh, 1851). The descent of the houses of Angus and Dalkeith was first ascertained by Riddell in his *Remarks upon Scotch Peerage Law*, pp. 154-64 (Edinburgh, 1833), and in his *Stewartiana*. The charters and correspondence of the Morton family have been edited for the Bannatyne Club by Mr. Cosmo Innes, in the *Registrum Honoris de Morton* (Edinburgh, 1853). Consult especially *Dictionary of National Biography*, xv., 261-375.

DOUGLAS, DAVID (1798-1834). A Scottish botanist and traveler, born at Scone, Perthshire. He visited the United States in behalf of the Royal Horticultural Society in 1823. In his capacity as a collector he set out on a tour to the Pacific in 1824, and in the following year reached Fort Vancouver. It was on this scientifically fruitful journey that he discovered the spruce subsequently named after him, the 'ribes,' several species of gooseberry and currants, and other plants, as well as birds and mammals. After another sojourn of five years in California and British Columbia, he visited the Sandwich Islands in 1834, where he died from wounds inflicted by an infuriated bull. He introduced into botany more than 150 specimens of trees and plants indigenous to America.

DOUGLAS, ELLEN. A character in Scott's *Lady of the Lake*, who receives a signet ring from the King, disguised as the Knight of Snowdon, and later takes it to Stirling, making the monarch redeem his pledge by pardoning her father and lover.

DOUGLAS, GAWIN or GAVIN (c.1474-1522). A Scottish poet, the third son of Archibald, fifth Earl of Angus. He was educated at Saint Andrews for the Church, and was early appointed to Prestonkirk, near Dunbar. In 1501 he was made provost of Saint Giles, Edinburgh. From the marriage of his nephew, the sixth Earl of Angus, to the widowed queen of James IV., Douglas expected rapid preferment; but the jealousy of the nobility and the Regent Albany was such that Douglas, who had, through the influence of the Queen, obtained the bishopric of Dunkeld directly from the Pope (January, 1515), was tried before the Scottish peers, found guilty of conspiring against the privileges of the Crown, and condemned to imprisonment. He was set at liberty in about a year, and inducted into his bishopric. Owing to his nephew's ill-treatment of the Queen, who thereupon joined with the Regent against the Douglases, he was deprived of his bishopric (1520). He went to England to obtain the aid of Henry VIII., but accomplished nothing, and died suddenly of the plague in London. His poems belong mostly to his early life. They comprise two allegories, entitled, *The Palice of Honour* and *King Hart*, and a translation of Vergil's *Æneid* into Scottish verse. There is, besides, a minor poem on *Conscience*. To each book of the *Æneid* is prefixed a description of Scottish scenery, and the translation, finished in 1513, is the first complete rendering of a long Latin classic into English. In his original poems Douglas carried on the tradition of Chaucer. His allegories are beautiful, and his landscapes surpass any others in our early poetry. His *Works*, edited, with a memoir, by Small, were published in four volumes (Edinburgh, 1874).

DOUGLAS, GEORGE. The temporary keeper of Lochleven Castle, in Scott's *Abbot*. He falls in love with Mary, Queen of Scots, helps her to escape, and is killed in the battle of Langside.

DOUGLAS, Sir HOWARD, Bart. (1776-1861). An English general and author of important military and naval treatises, born at Gosport. After serving in Spain and Portugal, he was appointed Governor of New Brunswick, 1823-29, and Lord High Commissioner of the Ionian Islands, 1835-40, and elected member of Parliament for Liverpool, 1842-47. He was made general in the army in 1851, and colonel of the Fifteenth Infantry Regiment. He died at Tunbridge Wells. His best-known work is *Military Bridges and the Passage of Rivers* (London, 1816), an essay which, it is claimed, suggested the suspension bridge. His treatise on *Naval Gunnery* was regarded as authoritative in several countries.

DOUGLAS, JOHN (1721-1807). An English author and divine, the son of a shopkeeper at Pittenweem, Fifeshire, Scotland, educated at Dunbar and Oxford, and ordained deacon in 1744. As an army chaplain he was present at the battle of Fontenoy (1745). Two years later he was ordained priest. Preferment after preferment followed until, in 1791, he became Bishop of Salisbury. He died May 18, 1807. Douglas only occasionally resided on his livings. He generally spent the winter in London and the summer at fashionable watering-places, in the society of the Earl of Bath, who was his great patron. Among his writings, mostly controversial, are: *Vindication of Milton from the Charge of Plagiarism, Adduced by Lauder* (1752); *A Letter on the Criterion of Miracles* (1754), a reply to Hume; and many political pamphlets. He also edited the journals of Captain Cook. His *Miscellaneous Works*, edited and containing a *Life* by Macdonald, were published in Salisbury (1820).

DOUGLAS, Sir JOHN SHOLTO. See QUEENSBERRY, MARQUIS OF.

DOUGLAS, ROBERT KENNAWAY (1838—). An English Sinologue, born at Larkbear House, Devon. He was attached to the English Legation at Peking, and upon his return taught Chinese in King's College, and became governor of Dulwich College. He wrote the articles on China and the East in the *Encyclopædia Britannica*, a catalogue of the Chinese books and manuscripts in the British Museum (1877), and *Two Lectures on the Language and Literature of China* (1875); *The Life of Jenghiz Khan* (1877); *Confucianism and Taoism* (1879); *China* (1882); *Europe and the Far East* (1904).

DOUGLAS, STEPHEN ARNOLD (1813-1861). An eminent American political leader. He was born in Brandon, Vt., April 23, 1813. He passed his boyhood in his native State and in western New York; went to Illinois in 1833; taught school and studied law for a year; was admitted to the bar in 1834, and began practice in Jacksonville. Within a year he was elected State's attorney for the most important judicial circuit in Illinois, and his rise thenceforward was rapid and brilliant. In 1836 he was elected to the Lower House of the State Legislature, and in the following year was made register of the Federal land office at Springfield. In 1838 he was an unsuccessful Democratic candidate for Congress, but in January, 1841, was appointed Secretary of State of Illinois, which position, however, he resigned within a month to take a seat on the bench of the Supreme Court of the State. After two years he resigned this position also, and thereafter served in Congress, first as a Representative (from 1843 to 1847), and then as a Senator, from 1847 until his death. In figure, he was below the middle height, but his frame was vigorous and his manner impressive. "Little Giant," says Schouler, "he was presently called; for, being both able and adroit in policy and full of resources, he gave the image of power under close compression." As chairman of the Committee on Territories, first in the House and then in the Senate, his position was peculiarly important. He favored the annexation of Texas and the Mexican War, opposed the Wilmot Proviso (q.v.), defended the Compromise measures of 1850, and upheld the extreme demands for the Oregon Territory. He became especially conspicuous, however, through his proposal and advocacy of the doctrine of 'popular sovereignty,' or 'squatter sovereignty,' which denied the power of the Federal Government to legislate on slavery within the Territories, and recognized the right of the people of each Territory to legislate upon the subject for themselves. This doctrine, first announced by Lewis Cass (q.v.), in December, 1847, was definitely formulated by Douglas in 1854, when he presented the Kansas-Nebraska Bill, which precipitated anew the struggle over the extension of slavery in the national Territories. The bill, in its first draft, also in precise terms announced the doctrine that the Missouri Compromise had been superseded by the Compromise of 1850, and, although nothing in the statutes warranted such an assertion, its political effect was great and immediate. The passage of the act brought upon Douglas much harsh criticism throughout the North, and indicated, on the other hand, the increasing strength of the upholders of slavery. (See KANSAS-NEBRASKA BILL.) Douglas now became, more than ever, a national force. Nevertheless, in 1856, as in 1852, he failed to secure the Presidential nomination. His campaign in 1858 for the election of the State Legislature, which was to name his successor in the Senate, led to the famous debates with Lincoln, in which the problems of slavery were thoroughly discussed and the foundation laid for the national reputation of his opponent. Douglas secured a reëlection to the Senate, but his position had become so altered through his opposition to the recognition of the Lecompton Constitution in Kansas and by reason of his 'Freeport Doctrine' (see FREEPORT, Ill.), that in 1860 he was unacceptable to Southern Democrats as a Presidential candidate. However, the Northern Democrats would not support for the Presidency a man holding the prevailing Southern views on slavery. This brought about a sectional division of the nominating convention and the subsequent nomination of Douglas for the Presidency by his Northern followers assembled in Baltimore. In the ensuing election, he received only twelve electoral votes, but his popular vote was next to that of Lincoln. His influence continued to be strong, and his hearty support of Lincoln's administration upon the outbreak of the Civil War was of powerful effect in the defense of the Union. Consult *Life of Stephen A. Douglas*, by J. W. Sheahan (New York, 1860); volumes i. and ii. of Rhodes's *History of the United States from the Compromise of 1850*, 5 vols. (New York, 1892-1904); *Stephen Arnold Douglas* (Boston, 1902), by W. G. Brown, in the "Riverside Biographical Series."

DOUGLAS, WILLIAM LEWIS (1845—). An American manufacturer and politician, born in Plymouth, Mass., and educated in the public schools. He began work at the age of seven in a shoe factory, and in 1865 went to Colorado, returning to Brockton, Mass., in 1876 and establishing a shoe factory. He was a member of the Massachusetts Legislature from 1883 to 1887, and in 1891 was elected mayor of Brockton. In 1904 he was elected governor of Massachusetts on the Democratic ticket.

DOUGLAS FIR. See SPRUCE.

DOUGLASS, DAVID BATES (1790-1849). An American civil and military engineer, born at Pompton, N. J. He graduated at Yale in 1813, entered the army, and rendered effective service in the defence of Fort Erie against the British. In 1819-20 he was assistant professor of natural and experimental philosophy at West Point. Subsequently he held the professorship of mathematics, and from 1823 that of civil and military engineering, which he resigned in 1831 to become chief engineer in the Morris Canal Company. His most important engineering work for New York City was the making of surveys and plans for the Croton Aqueduct and for Greenwood Cemetery. He was president of Kenyon College from 1841 to 1848, when he was made professor of mathematics at Hobart College.

DOUGLASS, FREDERICK (1817-95). An American anti-slavery orator and journalist, born at Tuckahoe, near Easton, Md. His father was a white man, his mother a negro slave, and he was reared as a slave on the plantation of Col. Edward Lloyd until he was ten years old, when he was transferred to a relative of his owner in Baltimore. There he worked in a shipyard, and taught himself to read and write. In 1838 he escaped from slavery under the disguise of a sailor, and changed his name from Frederick Augustus Washington Bailey to Frederick Douglass. He proceeded first to New York City, and then to New Bedford, Mass., where he married a negro woman, and where for several years he was employed as a day laborer. In 1841 he attended an anti-slavery convention at Nantucket, and spoke with such power and eloquence that the Massachusetts Anti-Slavery Society sent him out as a lecturer under its auspices. He met with so much success that an invitation to lecture in Great Britain was extended to him and was accepted. In 1845 he published his autobiography, and went to England, where he remained two years, and where a contribution of £150 was raised to buy his freedom in regular form. On his return to America he settled at Rochester, N. Y., and began to publish a weekly Abolition newspaper, which was continued until 1860, being called *The North Star* until 1850, when it was renamed *Frederick Douglass's Paper.* In 1855 he rewrote his autobiography, which was republished in 1882 as the *Life and Times of Frederick Douglass.* In 1871 he was secretary to the Santo Domingo Commission; in 1872 a Presidential elector for the State of New York; in 1876-81 United States marshal for the District of Columbia; in 1881-86 recorder of deeds in the District; and in 1889-91 Minister to Haiti. Consult Lives by Holland (New York, 1891) and by Chesnutt (Boston, 1899).

DOUGLASS, Sir WILLIAM FETTES (1822-91). A Scottish painter, born in Edinburgh. He began by painting landscape, but afterwards became a figure painter. Toward the close of his life he produced some delicate water-colors. Among his works are: "Dante and His Friends in Hell" (1862); "The Magic Mirror" (1872); "The Conspirators" (1867); "The Rosicrucians" (1856); "Stonehaven Harbor;" and "A Fishing Village." Consult *Photogravures from the Works of Sir W. F. Douglass, with a Critical Sketch by J. M. Grey* (1885).

DOUKHOBORS. See DUKHOBORTSKY.

DOULS, do͞ol, CAMILLE (1864-89). A French explorer, born at Rodez. He entered upon his tours of exploration in 1887, when he visited the region south of Morocco. He was captured and imprisoned by one of the native tribes, but subsequently liberated, and succeeded in reaching Morocco. In 1888 he began another tour, intending to proceed through the Sahara as far as Timbuktu; but after penetrating for a considerable distance into the country he was assassinated by his two Tuareg guides. The results of his first voyage were published in the *Bulletin de la Société de Géographie* (Paris, 1888); *Revue de Géographie* (Paris, 1888); and in *Le Tour du Monde* (Paris, 1888).

DOUL′TON, Sir HENRY (1820-97). An English potter, born in London. He conducted the largest pottery works in the world. It was chiefly he who effected the revival of art pottery. The most noteworthy of his ware was the "sgraffito" which traced its origin to the self-glazed stoneware of the latter part of the Seventeenth Century. Consult Chaffers, *Pottery and Porcelain* (London, 1900).

DOUMER, do͞o′mĕ′, PAUL (1857—). A French statesman born at Aurillac (Cantal). He became in 1885 chief assistant to Floquet, president of the Chamber of Deputies, and in 1888 was elected as a radical to that body. He was minister of finance in the Bourgeois cabinet (1895-96) and from 1896 to 1902 was governor-general of French Indo-China. Reëntering the lower house in 1902 he became head of the Budget Commission, and, in 1905, president of the Chamber. In 1906 he was the candidate of the moderate and reactionary parties for president of the republic to succeed Emile Loubet, but was defeated by Armand Fallières (January 17). He published *L'Indo-China française* (1904) and *Livre de mes fils* (1905).

DOUR, do͞or. A town of Belgium, in the Province of Hainaut, nine miles west-southwest of

Mons (Map: Belgium, B 4). Coal and iron mines are worked in the vicinity, and some coke is produced. There is also a thread-mill. Population, in 1900, 11,431.

DOURO, dō′*e*-rô. See Duero.

DOUROUCOULI, dōō′rōō-kōō′lê (South American Indian). A small monkey of Brazil of the genus Nyctipithecus, sleeping by day but active and fierce at night in pursuit of birds and insects. The body is about nine inches long, the tail 14; fur soft and grayish white, with a brown stripe down the back. The head is round and the eyes are extremely large and prominent. Douroucoulis look more like cats than monkeys, and sit up like dogs. Several species are known, all confined to South America, where they represent the lemurs of the Old World. Consult Bates, *A Naturalist on the Amazons* (London, 1863).

DOURRA, dōōr′rȧ. See Sorghum, paragraph *Non-saccharine.*

DOU′SA, Janus (Jan van der Does) (1545-1604). A Dutch statesman and historian. In 1572 he was sent by the Estates of Holland as the head of an embassy to England, to solicit aid from Queen Elizabeth, and in 1574 was Governor of Leyden when it was besieged by the Spaniards. When the University of Leyden was founded, he was appointed first curator. In 1591 he was appointed a member of the Sovereign Council. His principal work was the *Annals of Holland* (*Annales Rerum*), a Latin hexameter history, covering the period A.D. 898-1218. He also published a critical edition of Horace.

DOUSTERSWIVEL, dōō′stẽr-swiv-*e*l, Herman. A German adventurer in Scott's *The Antiquary*, who pretends to discovering money with a divining-rod. The name was applied as a nickname to Dr. John Spurzheim, who was active in introducing phrenology in England.

DOUVILLE, dōō′vêl′, Jean Baptiste (1794-c.1835). A French traveler, born at Hambie, Manche, France. He traveled extensively in Asia and South America, and in 1832 published *Voyage au Congo et dans l'intérieur de l'Afrique équinoxiale*, describing his discoveries in Central Africa. For this he was honored with the gold medal of the Société de Géographie of Paris, and with honorary membership in the Royal Geographical Society of London. Later, however, his work was shown to be a fabrication based on early Portuguese discoveries.

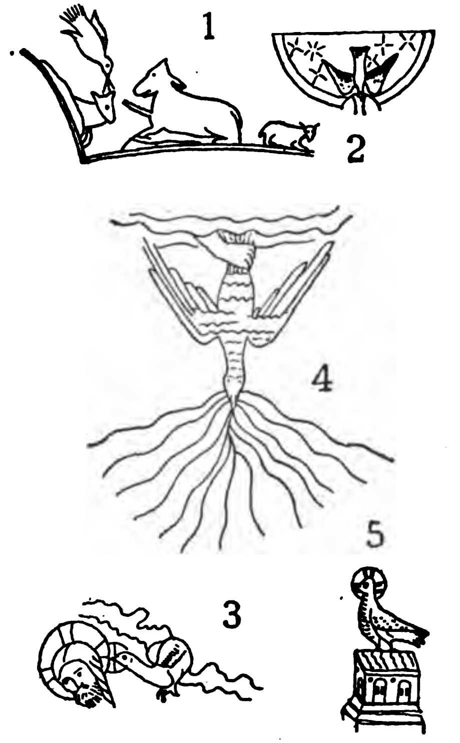
DOUW, dou, Gerard. See Dou, Gerard.

DOUZETTE, dōō-tsĕt′t*e*, Louis (1834—). A German landscape painter. He was born at Triebsees, Pomerania, and studied with Eschke at Berlin. His specialty was moonlight painting, in which genre he excelled. Among his best works are: "Moonlight Night in Winter" (1865); "Swedish Coast by Moonlight" (1866); "Moonlight on the Gulf of Venice" (1876; Melbourne); "Moonlight on the Fjord" (1883; Dresden Gallery); "Harbor of Lübeck by Moonlight" (1891). Douzette received the gold medal at the Berlin Art Exhibition of 1886.

DOVE (Icel. *dūfa*, Ger. *Taube*, Dutch *duif*, Goth. *dūfō*, perhaps connected with Ir. *dub*, black, or possibly with AS. *dyfan*, to dip, from *dūfan*, to dive). A pigeon. No scientific distinction separates pigeons from doves, but the latter word is attached to certain species, especially those which have been partly or wholly domesticated, as the ring-dove, rock-dove, and stock-dove of Europe, and still more particularly to the group of turtle-doves constituting the genus Turtur. These are small, graceful, modestly dressed representatives of their kind, the type of gentleness and purity. The common species (*Turtur communis*) is migratory in Europe, and seems to be increasing. Another of the many Old World species, abundant in Asia Minor and eastward, and erroneously named *Turtur Senegalensis*, is regarded as the 'turtle' of Scripture. In the United States, the bird frequently called turtle or Carolina dove is *Zenaidura macroura*, whose plaintive, throbbing refrain in early summer is familiar throughout the whole land, and makes its other name, 'mourning-dove,' seem sadly appropriate. It is migratory, but with the spread of civilization and consequent increasing certainty of food about barns, etc., it is more and more remaining in the northerly districts throughout the winter. The scaled doves (Scardafella) are small and beautiful species of semi-tropical America; and another group belonging to the warmer parts of America and of terrestrial habits are called ground-doves. Doves' nests are very slight structures, and the eggs are white. An example (that of the American Zenaida dove) is shown on the Colored Plate of Eggs of Water and Game Birds.

Symbolism of the Dove. The dove has taken a large place in legend, folk-lore, and poetic and religious symbolism. Proper names derived from the dove have always been used in the Orient as descriptive of loveliness, and were especially applied to beautiful women. The name Semiramis is said to mean 'mountain dove,' and the bird became the ensign of her army. Mr. Charles De Kay relates in his *Bird Gods* (New York, 1898) how extensively the dove was woven into the pagan worship of ancient Europe, and its place in early Christian art and religious symbolism is prominent. The people of northern Europe used to say that the ring-dove or cushat perched near the cross when Jesus was expiring, and wailed its sorrow to alleviate His agony. To the Jews, from an immemorial time, it had been a type of innocence, and elsewhere it had been associated since the Olympian age with the higher idea of Venus as a symbol of natural human affection—the love that goes with, or proceeds from, purity and simplicity of heart. It had a part in marriage scenes, and was naturally introduced by early painters into pictures of the Madonna and Child and of female saints. These qualities, combined with their mournful notes, made doves equally appropriate to moods of sorrow, and they were a part of the furniture of most pagan funerals. This passed on into Christian usage, and their likenesses, generally with an olive branch, were carved on thousands of tombs in the catacombs beneath Rome and elsewhere, emblematic of eternal peace. Various meanings seem to have been attached to these mortuary carvings, but the prevalent idea was that of portraying the departure of the soul from the body; and, later, artists often represented a white dove issuing from the lips of dying martyrs, as occurs in old pictures of Santa Scholastica, the sister of Saint Benedict, and of Santa Eulalia, the Spanish girl martyr who expired under tortures inflicted by the Emperor Diocletian. Hereby the human soul is represented as purified by suffering.

A very natural specialization of this idea was to make an approaching dove symbolize the divine soul or Holy Spirit, first in the general sense of heavenly messenger (i.e. inspirer), and next as the third person of the Trinity. In the former sense it is almost invariably placed in old pictures near certain saints who are supposed to have been particularly inspired, as Saint Thomas Aquinas, Saint Hilary, and others. Few, if any, early paintings of Pope (Saint) Gregory the Great exist in which a dove is not resting upon his shoulder or hovering at his ear, whispering messages from on high. In this sense, but especially in that of signifying the Holy Ghost, the dove appears in most of the early representations of scenes in Christ's life—most frequently, perhaps, in pictures of His baptism, literally rendering Saint John's words (i. 32): "I saw the Spirit descending from heaven like a dove." The earliest instance of it in Christian art known to Mrs. Jameson is a bas-relief from a tomb dated A.D. 359. "The next instance," she cites, "is from a mosaic in the Church of Santa Maria Maggiore, Rome, fifth century, and is the earliest representation of the Annunciation."



1. Dove as Holy Spirit; shedding blessings on the Saviour (Agnus Dei) at his baptism. Earliest example of the dove in Christian art. (From a bas-relief on the tomb of Junius Bassus, A.D. 359.)
2. Descent of the Holy Spirit as a dove upon Jesus; Heaven is represented as a circle studded with stars. (From a MS. of the ninth century in the British Museum.)
3. The Holy Spirit as a dove speaking into the ear of Jesus at his baptism. (From a French MS., A.D. 1100, in the British Museum.)
4. The hand of God extending grace or a blessing as a dove from Heaven. (From a Saxon MS. in the British Museum.)
5. Dove standing on the altar. (From an Italian altar-stone of the twelfth century.)

In the early pictures the dove's head is surrounded with a golden nimbus, which is frequently cruciform. Seven rays proceed from it, terminating in seven stars, signifying the 'seven gifts of the Holy Spirit.' In her *Symbols and Emblems of Christian Art*, Louisa Twining gives varied examples of its treatment. Sometimes seven doves are attributes of the Virgin, occasionally within a *vesica piscis*. An English manuscript poem of the fourteenth century is illustrated by a series of scrolls inscribed: "Ye gyfte of Wisdome; Ye gyfte of pite; Ye gyfte of Strengthe; Ye gyfte of counsaill; Ye gyfte of Understandinge; Ye gyfte of connynge; Ye gyfte of dieede [a misprint for *dreede*, meaning dread,

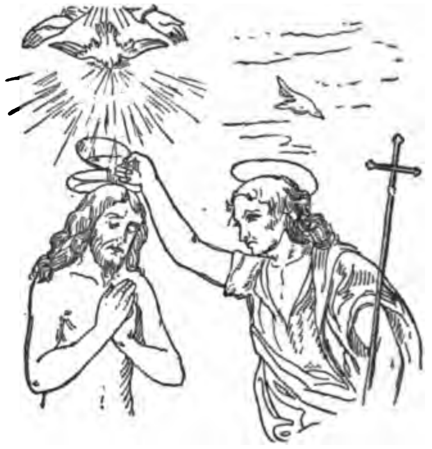
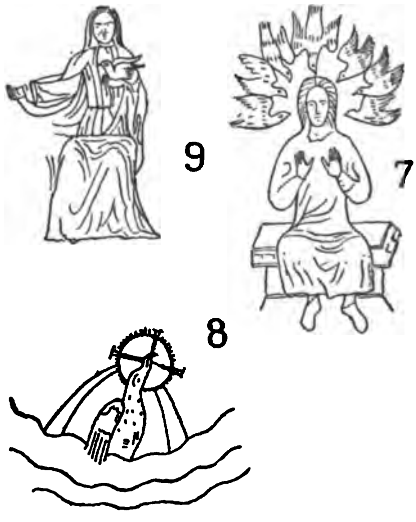


Fig. 6. Dove typifying grace of the Holy Spirit descending upon a Christian in baptism. (From a painting, "Baptism of Verrocchio," in Florence.)



7. The Seven Gifts of the Spirit. This is a clear rendering of a theme which appears under many and sometimes confusing disguises. In this case it is notable that no nimbus or aureole is present, the circle of seven doves about the head of Jesus themselves forming a sort of aureole.
8. The dove 'moving on the face of the waters' at the creation. (From a Saxon MS. of the eleventh century, in the British Museum, where the Creator is represented above this figure holding compasses and scales.)
9. The Holy Spirit, in human form, holding a dove as a symbol. (From a sculpture of the sixteenth century, in the Church of Verrières.)

fear]." Around the page are the lines below, in Old English text:

> "In this desert wild and waste,
>   Seven fowls are flying with flight,
> That are seven gifts of the Holy Ghost,
>   That nowhere but in clean hearts will light
> And dwell there if they find them chaste,
>   And give them ghostly strength and might
> So big and bold that they then haste
>   To pray to God both day and night."

A dove with six wings is a type of the Church of Christ. Sometimes the pyx is in the form of the dove, suspended above the altar, the covers of fonts often bear the same image, and it is common as a symbolic decoration of baptisteries. Twelve doves represented the Twelve Apostles, and the bird is the emblem of any believer whatever.

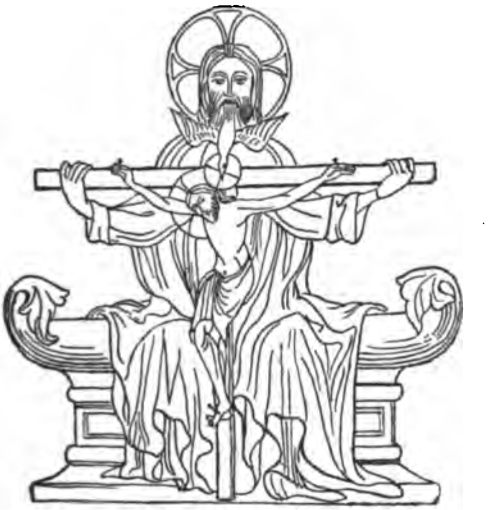


Fig 10. An Italian representation of the Trinity, the Father and the Son in human form, and the Holy Spirit symbolised by a dove born from the breath of the Father and descending upon the Son. (Fourteenth century.)

The dove belongs to various legends more or less remote from the present line of thought. Thus, the emblem of Saint Remigius is a dove with an oil-cruse in its beak, "recalling that at the anointing of King Clovis a cruse of oil was brought from heaven by a dove at the prayer of this saint." In other cases it represents a visual benediction descending upon a cross or upon the sacred monogram. Thus the significance of the bird came to be so broad as to mean simply *Christian.*

DOVE. The dove is by the common law one of the wild animals (*feræ naturæ*), and, as such, not the subject of larceny, unless at the time of the taking in the custody of the person asserting ownership. An escaped pigeon is, like other wild things, common property; but if it be domesticated, or if found in a dovecot, it partakes of the status of domestic animals and is protected like other personal property. The right of erecting or keeping dovecots was in England, as well as in Scotland, in Normandy, and elsewhere, an exclusive privilege of the feudal lords, and was rigorously protected by law, but such exceptional privileges have long been abolished. See FERÆ NATURÆ.

DOVE, dō′ve, ALFRED (1844—). A German historian. He was born in Berlin, a son of Heinrich Wilhelm Dove (q.v.). After studying medicine and the physical sciences at Heidelberg and Berlin (1861-66), he became a journalist, and was successively the editor of the *Grenzboten* (1870) and of the publication *Im Neuen Reich.* During the period 1874-91 he was professor of history at Breslau (1874-84) and Bonn (1884-91). Returning to his journalistic activity in the latter year, he became for a time editor of the *Allgemeine Zeitung* in Munich. He published the posthumous manuscripts of Von Ranke, completing both the *Weltgeschichte* and the editing of the *Sämtliche Werke* of that celebrated author in 1890, after an arduous labor of four years. Among his own publications may be mentioned *Deutsche Geschichte im Zeitalter Friedrichs des Grossen und Joseph II.*

DOVE, HEINRICH WILHELM (1803-79). A German physicist and meteorologist, born at Liegnitz, in Silesia. He studied at Breslau and Berlin. He was successively privat-docent and assistant professor of natural philosophy in Königsberg. He was transferred to the University of Berlin in 1829, and in 1837 was elected to a seat in the Academy of Sciences. His writings, which are very numerous, are to be found for the most part in the memoirs of that academy, and in Poggendorff's *Annalen.* His works include researches dealing with meteorology, climatology, induced electricity, and circularly polarized light. Among his works may be mentioned: *Ueber Mass und Messen* (1835), a treatise on the art of measuring, and the origin and comparison of the metrical standards of different nations; *Meteorologische Untersuchungen* (1837); *Ueber die nicht periodischen Aenderungen der Temperaturvertheilung auf der Oberfläche der Erde* (1840-47); *Untersuchungen im Gebiete der Inductionselectricität* (1843). In his capacity of director of the Royal Observatory, he published annually an account of his labors and observations. The treatise on the *Distribution of Heat on the Surface of the Globe,* which was published in 1853 by the British Association, is also a work of importance. In this work he enters fully into the causes of periodic variations of temperature at different parts of the globe, and lays down in admirable charts the monthly and annual isothermal and isabnormal lines, thus tracing the variations in form and position of the different isothermals throughout the year. *Das Gesetz der Stürme* (4th ed., 1874) has also been translated (*The Law of Storms*). Other works are: *Ueber Electricität* (1848); *Optische Studien* (1859); *Eiszeit, Föhn und Sirocco* (1867); *Klimatologie von Norddeutschland* (1871).

DOVE, dō′ve, RICHARD WILHELM (1833—). A German jurist, son of the preceding. He was born in Berlin, studied both ecclesiastical and civil law at Berlin and Heidelberg, and was appointed professor successively in the universities of Tübingen, Kiel, and Göttingen. In 1873 he was nominated a member of the Prussian Court of Ecclesiastical Affairs. Most of his writings have been published in the *Zeitschrift für Kirchenrecht,* a leading European organ of ecclesiastical law, which he established and began to edit in 1860.

DOVEKIE (probably from *dove* + diminutive *-kie*). The little auk (*Alle alle*), sea-dove, or rotge, an Arctic sea-bird (see AUK) which regularly appears in winter on the coasts of Norway, northern Scotland, and America as far south as Maine, where it is called 'pine-knot.' Occasionally it is driven farther south or inland. It is about eight inches long, black and white in color, has a bill like a partridge, and flies and dives with extreme swiftness and dexterity. It feeds upon small fish, crustacea, worms, etc., and frequently great numbers are found dead on our coasts, starved or crushed by the icy gales. In summer it becomes sooty brown and resorts in countless hordes to the most northerly islands and headlands to breed—especially to Spitzbergen, where each pair hide their single white egg deep in the recesses of the loose rocks of the coast mountains, or failing that cover, on some ledge. The same name is given by sailors to the black guillemot (*Cephus grylle*).

DOVE-PLANT. See HOLY-SPIRIT PLANT.

DOVER. A Parliamentary and municipal borough of Kent, England, on the Strait of Dover, at the mouth of the Dour, 66 miles east-southeast of London (Map: England, H 5). It is the headquarters of the southeastern district of the British Army, and is not only a charmingly situated watering-place, but, being the nearest point of the English coast to France, 21 miles distant, is a seaport of importance. Among the noteworthy buildings in Dover, aside from its fortifications, are the two ancient churches of Saint Mary and Old Saint James; the Maison Dieu, founded in the thirteenth century as a pilgrims' hospital, but now used for municipal purposes as a part of the new town hall; and the remains of Saint Martin's Priory, incorporated as a part of Dover College. The fortifications are very extensive. On the chalk cliffs to the east of the town rises Dover Castle, founded by the Romans and fortified and enlarged by the Saxons and Normans. It contains the remains of a Roman pharos, and an old fortress church, a unique specimen of Roman-British architecture. To the north of the castle is Fort Burgoyne, a drop redoubt, the north centre bastion and citadel. On these heights are large barracks, the ruins of another pharos, and a circular church of the Knights Templar.

In 1891 it was decided to form an enormous harbor by building out the Admiralty Pier to form the western boundary, and erecting a new pier east of the castle as the eastern boundary. The harbor facilities include two large docks. The corporation owns its water-supply and owns and operates electric street railways. It maintains public baths, markets, and a technical school. Dover returns one member to Parliament. The United States is represented by a consular agent. No special trade is attached to the town, which transacts a miscellaneous maritime business with the French and Belgian ports in the import of woolen and silk goods, lace, feathers, skins, artificial flowers, leather goods, wine, metal ores, and timber and in the export of wearing apparel, cotton yarn and manufactures, machinery and mill work, silverplate and plated ware, books, etc. The total tonnage entered and cleared in 1904, excluding coastwise vessels, was 3,505,000. Dover offers excellent harbor accommodation for every variety of shipping. Population, in 1901, 41,800. In Roman days Dover was known as Dubris; the Normans called it Dovore; the French, Douvres. Fortified and walled by William the Conqueror, during whose reign it was nearly burned down, noted as the place of King John's submission to the Pope, besieged by the French, held during the Civil War by the Parliamentarians, threatened by the first Napoleon, and long celebrated as the headquarters of the lord wardens of the Cinque Ports, Dover holds a distinguished place in English history. Consult Statham, *History of Dover*, with a bibliography (London, 1899).

DOVER. The capital of the State of Delaware, and the county-seat of Kent County, 48 miles by rail south of Wilmington; situated on Jones Creek, and on the Philadelphia, Baltimore and Washington Railroad (Map: Delaware, P 4). It is regularly built on elevated ground. The Wilmington Conference Academy (Methodist Episcopal) and the State College for colored students, an agricultural and manual training school, are located here. The public buildings include the State House, which contains a State library of 30,000 volumes, the county courthouse, and the Government post-office. There are monuments to persons distinguished in Revolutionary history. The city, situated in a noted fruit-growing region, has several fruit-canning and evaporating works. There are also planing and sawmills, foundry and machine shops, basket and crate factories, and other industrial establishments. Dover was laid out in 1717, became the capital of Delaware in 1777, and was incorporated as a town in 1829. Population, in 1890, 3061; in 1900, 3329.

DOVER. A town in Morris County, N. J., about 40 miles by rail west by north of New York City; on the Rockaway River, the Morris Canal, and the Lackawanna and the Central of New Jersey railroads (Map: New Jersey, C 2). It has large iron interests, railroad car-shops, ironworks, machine-shops, stove, furnace, and range works, rolling-mills, drill-works, knitting and silk mills, and an overall factory. A national powder depot has been established five miles from Dover. The town government, under a charter amended in 1875, is vested in a mayor, biennially elected, a recorder, aldermen, and councilmen, who constitute a unicameral municipal council. Dover was first settled about the middle of the Eighteenth Century, though in 1792 it had only four dwellings and a forge. It was incorporated as a village in 1826, and in 1869 as a town. Population, 1900, 5938; 1905, 6353.

DOVER. A city and county-seat of Strafford County, N. H., 11 miles by rail northwest of Portsmouth; on the Cocheco River, and on branches of the Boston and Maine Railroad (Map: New Hampshire, L 9). It is situated at the head of minor navigation on the Cocheco. The river here has a fall of over 30 feet, furnishing excellent water-power. Dover is an important shipping port. The chief industries include the manufacturing of cotton and woolen goods, machinery, castings, belting, bricks, lumber in various products, boots and shoes, etc.—industries which, in 1906, employed about 4000 persons, represented a capital investment of about $6,000,000, and produced an output valued at nearly $7,000,000. Dover has a public library, a fine city hall and opera house, two hospitals, a children's home and a home for the aged. The city is governed by a mayor, elected annually, and a bicameral council, which controls the appointments to the subordinate municipal offices. The municipal water commission operates an efficient system of water-works. First settled in 1623, and therefore the oldest city in the State, Dover was organized as a town in 1633, received its present name in 1639, and was chartered as a city in 1855. It was a frontier town throughout the Seventeenth Century, and frequently suffered from Indian attacks, the most disastrous of which occurred on June 28, 1689, when 23 of the inhabitants were killed, 29 carried into captivity, and a number of houses destroyed. Population, 1900, 13,207; 1906 (local est.), 15,000.

DOVER. A town and county-seat of Stewart County, Tenn., 67 miles (direct) west-northwest of Nashville, on the Cumberland River (Map: Tennessee, D 4). It is a mile from Fort Donelson. There is here a national cemetery of 672 graves. Population, in 1900, 400.

DOVER, Strait of. A strait separating England from France, and connecting the English Channel with the North Sea (Map: England, H 6). On the English coast its limits are defined by the promontories of Dungeness and South Foreland, and on the French coast it extends from Cape Gris-Nez to Calais. It is 20 to 27 miles wide and 1 to 20 fathoms deep. The Ridge Shoals near the middle of the strait are over 8 miles long, and have a depth of 10 to 24 feet. Both the English and French shores are formed by chalk cliffs. The strait has been carefully surveyed by engineers with a view to bridging or tunneling it. There is great opposition in England, on military grounds, against the construction of a tunnel. It is, perhaps, the most frequented maritime route in the world.

DOVER'S POWDER (named from Thomas Dover, an English physician of the Eighteenth Century, who first prepared the powder). An old preparation of powder of ipecacuanha 1 dram, opium in powder 1 dram, and sulphate of potash 1 ounce, the whole being thoroughly mixed. Sugar of milk is now substituted for the sulphate of potash, and occasionally saltpetre is added. The powder is largely used in domestic practice to abort a "cold," as well as at the beginning of any attack of fever; but it should be used cautiously, on account of the opium it contains.

DOVE-TICK. A blind tick (*Argas reflexus*), well known in Europe as a parasite of doves and some other birds. A closely related species is the Asiatic *Argas Persicus*, which dwells in houses "and by its punctures produces convulsions in man, and it is said that even death has resulted from its sting." A third species, the pique (*Argas nigra*), is also distressing. See Tick.

D'OVIDIO, dô-vēd'yô, **Francesco (1849—).** An Italian philologist and literary critic. He was born at Campobasso, and was educated at Pisa and Naples. In 1876 he became professor of Romance philology at the University of Naples. His thorough scholarship and keen criticism are shown in a large number of works, of which the following are the most noteworthy: *Dell' origine dell' unica forma flessionale del nome italiano* (1872); *Il vocalismo tonico italiano* (1878); *Storia della letteratura latina* (1879); *Il Tasso e la Lucrezia Bendidio-Machiavelli* (1882).

DOW, Gerard. See Dou, Gerard.

DOW, Lorenzo (1777-1834). An American preacher, noted for his eccentricities and zeal. He was born at Coventry, Conn., October 6, 1777. His education was limited. In youth he joined the Methodists (1799), but left them under a conviction that he was called to be a missionary to the Roman Catholics of Ireland. His preaching in that country attracted crowds of people, and brought him some persecution. He also visited England, introducing there the Methodist system of camp-meetings. He returned to the United States, and repeated his visits to Ireland and England in 1805. He afterwards preached for many years in the United States, traveling all over the country. His natural eloquence and his eccentricities of dress and speech attracted large audiences everywhere. He preached much against the Jesuits, whom he regarded as conspirators against civil and religious liberty. His *Polemical Works* appeared in 1814. Among his other writings are *The Stranger in Charleston: or, the Trial and Confession of Lorenzo Dow* (1822); *A Short Account of a Long Travel* (1823); and the *History of a Cosmopolite* (1851). Consult his *Life and Writings* (New York, 1854).

DOW, Neal (1804-97). An American temperance reformer. He was born in Portland, Maine, of Quaker parentage, and was educated at the Friends' Academy in New Bedford, Mass. He was twice Mayor of Portland, and in 1858-59 was a member of the State Legislature. In 1861 he was appointed colonel of the Thirteenth Maine Volunteers, which he commanded in General Butler's expedition to New Orleans. Promoted to the rank of brigadier-general in 1862, he commanded the fortifications at the mouth of the Mississippi, and later the Department of Florida. He was wounded and taken prisoner by the Confederates at Port Hudson in May, 1863, and was confined for eight months thereafter in Libby Prison. It was as a temperance reformer and orator, however, that he was best known. He was the author of the famous prohibition law enacted by the Maine Legislature in 1851, and traveled widely in the United States, Canada, and Great Britain, speaking on temperance questions and helping in the organization of societies for the furtherance of the reform. In 1880 he was the Prohibition candidate for President of the United States.

DOWAGER (OF. *douagiere*, from *douage*, dower, from *douer*, *doer*, Fr. *douer*, It., Lat. *dotare*, to endow, from Lat. *dos*, dower). A widow with a dower (q.v.). A title commonly applied only to the widows of persons of high rank. The Queen dowager in Great Britain, as the widow of the King, enjoys most of the privileges which belonged to her as Queen consort; but it is not high treason to conspire her death, because the succession to the crown is not thereby endangered.

DOWA'GIAC. A city in Cass County, Mich., 35 miles southwest of Kalamazoo, on the Michigan Central Railroad. It is in an excellent farming region, and has flour and lumber-mills and a canning factory. Among other industries are manufactures of grain-drills, stoves, and furnaces. Population, 1900, 4151; 1904, 4404.

DOW'DEN, Edward (1843—). An English scholar and critic. He was born in Cork, Ireland, May 3, 1843, and educated at Trinity College, Dublin, where he became, in 1867, professor of oratory. From this chair he was soon transferred to that of English literature. He won his place as a Shakespearean scholar by *Shakspere, His Mind and Art* (1875), which was followed by a *Shakspere Primer* (1877); an edition of the *Sonnets* (1881); *Introduction to Shakspere* (1893); a critical edition of *Hamlet* (1899); of *Romeo and Juliet* (1900); and of *Cymbeline* (1903). These works show a keen critical faculty and a genuine admiration of the great dramatist, although his "psychological" classification of the plays may be thought fanciful. Among Dowden's other critical and biographical works are: *Studies in Literature* (1878); *Southey* (1880); *Shelley* (1886); *Transcripts and Studies* (1888); *Wordsworth* (1892-93); *New Studies in Literature* (1895); *The French Revolution and English Literature* (1897); *A History of French Literature* (1897); *Robert Browning* (1904); *Michel de Montaigne* (1905). He published a volume of poems in 1876.

DOW'ELL, Stephen (1833-98). An English legal and historical writer. He was born on the Isle of Wight, graduated at Oxford in 1855, studied law at Lincoln's Inn, and in 1863 was appointed by Lord Palmerston assistant solicitor to the Board of Inland Revenue, an office which he held until 1896. In addition to numerous legal and historical tracts he was the author of several works on taxation, on which subject he was admittedly for many years one of the highest authorities in England. Among these works are: *The Income Tax Laws* (1874; 3d ed. 1890); *A Sketch of the History of Taxes in England* (1876); and *A History of Taxation and Taxes in England, from the Earliest Times to the Present Day* (4 vols., 1884), the standard work on this subject.

DOWER (OF. *doaire*, Fr. *douaire*, Prov. *dotaire*, from ML. *dotarium*, dower, from Lat. *dos*, dower). The common-law right of the wife to a one-third interest in the real estate of her husband. It is limited to freehold estates of inheritance, and the character of the holding must be such that the issue of the marriage, if any, might by possibility have inherited it. It extends, therefore, to all estates in fee simple of which the husband was seised at any time during coverture, and to all such fees tail as are limited to the issue of the husband by the wife in question. This interest in her husband's real estate attaches at the moment of marriage or of the subsequent acquisition by the husband of the property, and continues thereafter during the life of the wife, passing through three stages or forms. During the coverture and ownership of the property by the husband, she has an *inchoate* right of dower. This is a mere right or possibility of obtaining the property by surviving her husband. It is a right, however, which the courts will protect, as between her and her husband. He cannot deprive her of it either by a conveyance to a third person or by last will and testament. After the death of the husband, and before she has been put into possession of the specific one-third of his realty which should be set apart for her, she has a right of action for the purpose of obtaining her dower. It is the duty of the husband's heirs, or purchasers, or other persons who may be in possession of the property, to set out or *assign* her one-third to her, and an action lies to compel the performance of that duty. After such assignment has been made, and she has been given possession of the land, she acquires an interest or estate therein during her own life. In connection with her dower right she is also entitled to a residence in the chief house or home of her husband for forty days after his death, provided she remain unmarried and chaste during that time, and in the meantime to have her reasonable sustenance out of his estate. This right is known as the widow's quarantine. Dower attaches to real property only, and not to personal chattels. It is strongly favored by the common law. No act that the husband alone can do will bar it. If he sell real estate to which his wife's dower right is attached without having her unite in the transfer, the purchaser takes subject to such right. It is not necessary that the husband shall be actually in possession of the property in order to give the wife dower therein. The fact that he is seised, during the coverture, in fact or in law, of a beneficial estate of inheritance, legal or equitable, will be sufficient to support her claim to dower. The wife's common-law right of dower in her husband's real estate is of great antiquity and has analogies in most other systems of law. In our system it has passed through many stages. It is recognized as an indefeasible property right in the coronation oath of Henry I. (1100), though at that time and for many years afterwards it might be varied by other forms of dower, which are now obsolete, as *dowment at the church door* and *dowment by the father's assent*. These enabled the husband, by a declaration which formed part of the marriage service, to confer on his wife a dower right to the whole, or the half, or any other proportion of his lands which should be acceptable to her, and which, on his death, she might accept in lieu of the one-third accorded to her by the common law. If at that time she rejected the formal endowment, she was entitled to fall back on her common-law dower. The declaration of the bridegroom in our marriage service, "with all my worldly goods I thee endow," which is now of no legal effect whatever, is a curious survival of this ancient practice.

At a much later period, when the practice of conveying lands in trust, or to the use of others, had become common in England, the common-law right of dower was practically in abeyance, being replaced by a definite provision called a jointure, usually made in lieu thereof. This was rendered necessary by the fact that, under the system of uses, lands were commonly held by those who had only a beneficial interest therein and not the legal title, and there could be no dower in a purely beneficial, or equitable, estate. Upon the abolition of uses by the Statute of Uses in 1535 (27 Hen. VIII., c. 10) the right of dower revived, and it was expressly provided that the wife might elect between her jointure and her dower, but should not be entitled to both. See Jointure; Use.

Both in England and in many of the United States, modern statutes have materially modified the dower rights of the wife. Where dower is preserved by such statutes, the husband is usually given power, by his own act or deed alone, to bar it as to property which he desires to sell during the coverture. In England by the Dower Act of 1833 (3 and 4 Will. IV., c. 105) dower is barred by any expression of intention by the husband, whether direct or indirect, contained in any deed or will executed by him, that his wife shall not have dower in his lands or any part of them. In some of the United States in which a widow is given the right of inheritance, dower has been abolished.

In most of the older States, however, the common-law dower is still retained. In the absence of statutory changes there are several ways in which dower may be barred. These are: (1) By an absolute divorce. In the absence of statutory qualifications such a divorce bars dower whether it was obtained because of the misconduct of the husband or for that of the wife. But in some of the States if the wife obtain the divorce for the misconduct of the husband, she does not thereby lose her dower right. (2) If the wife join in the deed by which her husband conveys real estate, she will be thereby barred of dower. It is in order to secure this result that the wife commonly joins in her husband's conveyance. (3) If the wife induce any one to purchase her husband's real property by representing to him that she has no dower rights in such property, she will be estopped or precluded from subsequently claiming dower from that property against such purchaser or those who claim under him. (4) If the title of the husband be defeated, either while he lives or after his death, by one who claims under a paramount title, this will, in general, also defeat the wife's or widow's dower. (5) When, by the exercise of the right of eminent domain, the State takes real estate from the husband and makes compensation to him for it, the wife's right of dower in the property so taken is barred. But she may follow the proceeds or purchase money, and insist that her dower shall attach to that. So far as the right of dower is still recognized, it extends to equitable as well as to legal estates of inheritance. This has always been the rule in the United States and was made a part of the English law of dower by the Dower Act, above referred to. See HUSBAND AND WIFE; MARRIED WOMAN; and, for the corresponding right of the husband in the inheritable property of the wife, see CURTESY.

BIBLIOGRAPHY. Blackstone, *Commentaries on the Laws of England;* Digby, *An Introduction to the History of the Law of Real Property* (5th ed., London, 1897); Jenks, *Modern Land Law* (Oxford, 1899); Kent, *Commentaries on American Law* (12th ed., Boston, 1873); Washburn, *A Treatise on the American Law of Real Property* (6th ed., Boston, 1902); Scribner, *The Law of Dower;* Pollock and Maitland, *History of English Law* (2d ed., Cambridge and Boston, 1899).

DOWIE, JOHN ALEXANDER (1848—). The self-styled "First Apostle of the Lord Jesus the Christ, and General Overseer of the Christian Catholic Apostolic Church in Zion"; also, "Elijah II." He was born in Edinburgh, studied in the University there, entered the ministry, and was ordained a clergyman of the Congregationalist denomination in South Australia. He came to the United States in 1886, and ten years afterward organized his "church," which, in 1901, was established at Zion City—so named by him—on the shore of Lake Michigan, near Chicago. In 1904 Dowie led his "hosts" to New York City for the avowed purpose of regenerating the metropolis. In 1906 Zion City revolted against him, and finally suspended him from the church, charging him with misuse of investments, tyranny, polygamous tendencies, and other offences.

DOWITCHER (corruption of Ger. *deutsch*, German, or Dutch *duitsch*, Dutch). A popular name for certain shore-birds. They constitute the genus Macrorhamphus, are closely related to the snipes (q.v.), and are often called "gray snipe" or "red-breasted" or "red-bellied snipe." The bill is distinctly snipe-like, but the tail and feet are like those of sandpipers. Two species are recognized, but during the migrations one species (*Macrorhampus griseus*) is found along the Atlantic coast of the United States, while the other (*Macrorhamphus scolopaceus*) migrates through the Mississippi Valley and Western States. The dowitchers are about ten or twelve inches in length, with a bill two to two and a half inches long. The upper parts are chiefly black or blackish (in winter, brownish-gray), and the under parts dull pale rufous, more or less marked with black. See Plate of BEACH-BIRDS.

DOW'LAS (probably from *Doullens*, a town of France). A coarse, strong unbleached linen, much used in the Sixteenth Century, and said to have been made at Doullens, France. It was largely manufactured in southern Scotland and in Yorkshire in the Eighteenth Century, and used by working people for shirts and aprons.

DOW'LER, BENNET (1797-1879). An American physician. He was born in Moundsville, Va.; graduated at the medical school of the University of Maryland, and in 1836 settled in New Orleans, where he founded the Academy of Sciences, and for some years edited the *New Orleans Medical and Surgical Journal.* His experiments resulted in valuable discoveries in contractibility, calorification, and capillary circulation. He wrote a *Tableau of the Yellow Fever of 1853* (1854).

DOW'LING, JOHN (1807-78). An American Baptist clergyman. He was born at Pevensey, Sussex, England, and settled in the United States in 1832. He wrote *History of Romanism* (1845, revised 1871).

DOWN. A maritime county in the southeast of Ulster Province, Ireland (Map: Ireland, F 2). Area, 957 square miles. It has a low, rocky coast-line of 67 miles, or 125 by the inlets, skirted by many islets. The Mourne Mountains cover 90 square miles in the south, and rise 2796 feet in Slieve Donard. The chief crops are oats, potatoes, turnips, wheat, flax, and barley. Many hogs are raised. The chief manufacture is linen, especially the finer fabrics, such as muslin, woven in the houses of the small farmers. Flax and cotton mills are common. Hosiery, leather, salt, thread, and woolens are also made. These, with corn, butter, pork, and hides, are the chief exports. Capital, Downpatrick. Population, in 1841, 368,200; in 1891, 269,734; in 1901, 205,889.

DOWNCAST. The name of a shaft used for ventilating mines. The foul air is made to ascend through a flue, while fresh air descends through the downcast.

DOWN'ING, ANDREW JACKSON (1815-52). An American nurseryman, landscape gardener, and pomologist, born at Newburgh, N. Y. His influence upon American horticultural development is probably unsurpassed. To him must be accredited the introduction and development of the free or English school of landscape gardening in America. He planned the grounds about the National Capitol, the White House, and the Smithsonian Institution in Washington, D. C. To his foresight, and to his spirit as communicated to others, we owe our present American system of broad free municipal parks. Downing's monumental work, *Fruits and Fruit Trees of America* (1845), greatly extended by his brother Charles (q.v.), together with his numerous essays, form the bulk of his contribution to the literature of horticulture. Another important work is the *Treatise on the Theory and Practice of Landscape Gardening* (1841). These essays were first published in the *Horticulturist*, of which he was editor at the time of his death, and afterwards in book form under the title of *Rural Essays* (1854), for which book George William Curtis wrote a memoir of Downing. He was drowned while attempting to save the lives of others on the burning Hudson River steamer *Henry Clay*.

DOWNING, Charles (1802-85). An American nurseryman, the elder brother of A. J. Downing. He was born at Newburgh, N. Y. He was one of those who put nursery gardening on a scientific basis. In fact, his nursery became so much of an experiment station that after the death of his brother (see Downing, Andrew Jackson), with whom he had collaborated, he abandoned commercial horticulture and devoted himself for the remainder of his life to the amplification and revision of *The Fruits and Fruit Trees of America.* His efforts more than doubled the original scope of the volume, and made him until his death a recognized authority throughout the world on all questions pertaining to pomology, horticulture, and tree-growth.

DOWNING, Sir George (1623-84). An English soldier and politician. He was born in Dublin, and was the nephew of Governor John Winthrop, who induced him to complete his education at Harvard College in 1642. Some years afterwards he went to England and served in the Parliamentary army. During the Protectorate, he was a member of both Parliaments, was a leader of the movement for offering the crown to Cromwell, and afterwards was British resident at The Hague. He ingratiated himself with the exiled Stuarts, however, and after the Restoration was instrumental, through his treachery, in arresting three regicides. He was knighted in 1663, and became Secretary of the Treasury and one of the Commissioners of Customs. Downing Street, Whitehall, derives its name from him.

DOWNING COLLEGE. A college of Cambridge University, founded by Sir George Downing, of Gamlingay Park, Cambridge, who died in 1749, leaving his estates to be appropriated to the founding of a college in Cambridge, after various trust provisions had expired. The succession on which the trust depended dying out, a charter was obtained in 1800 for a college devoted especially to the study of law and medicine, for a master, two professors, and sixteen fellows. The original scheme was straitened by costly litigation, and only two sides of the quadrangle have so far been completed. The statutes were framed in 1805 and altered in 1860. The college had, in 1902, a master, eight fellowships, restricted to law and medicine, and ten scholars. In 1905 there were 91 undergraduates.

DOWNING STREET. A street in the "West End" district of London, leading from Whitehall. The Home Office, Foreign Office, Colonial Office, and East India Office are in it, and the name is used as a convenient synonym for the central powers of the British Government.

DOWN'PAT'RICK, or Down. A municipal borough and cathedral town in the county of Down, Ireland, of which it is the capital (Map: Ireland, F 2). It is situated near the mouth of the Quoyle, at the end of Lough Strangford, 21 miles south-southeast of Belfast, with which town it is connected by railway. The cathedral in its present form was restored in 1790 on the site of one built in 1412 and burned in 1538. Vessels of 100 tons reach the quay a mile from Downpatrick. It has manufactures of linen, muslins, soap, leather, and malt liquors. Population, 1901, 2993. Downpatrick was famous before the arrival of Saint Patrick, who founded religious establishments here. Consult *Ecclesiastical Associations of Downpatrick* (Belfast, 1897).

DOWNS (AS., OHG. *dūn*, Ger. *Düne*, Fr. *dune*, from Ir. *dūn*, Welsh *din*, hill, fort; ultimately connected with AS., Icel. *tūn*, Engl. *town*, OHG. *zūn*, Ger. *Zaun*, hedge). A term usually applied to hillocks of sand thrown up by the sea or the wind along the seacoast. It is also a general name for any undulating tract of upland too light for cultivation and covered with short grass. It is especially applied to two broad ridges of undulating hills in England south of the Thames, beginning in the middle of Hampshire and running eastward, the one (the North Downs) through the middle of Surrey and Kent to Dover (about 120 miles), and the other (the South Downs) through the southeast of Hampshire and near the Sussex coast to Beachy Head (about 80 miles). The highest point of the North Downs is Botley Hill, 880 feet, and that of the South Downs, Ditchelling Beacon, 858 feet. These uplands are covered with fine pasture, forming excellent feeding ground for the famous Southdown sheep. The valleys among the hills are usually fertile and admit of cultivation, so that an excellent field is furnished for mixed husbandry.

DOWNS, The. An important English roadstead off the southeast coast of Kent, opposite Ramsgate and Deal, between North and South Foreland (Map: England, H 5). It is protected externally by the Goodwin Sands, a natural breakwater with one to four fathoms of water, and often partly dry at low tide. It is defended by Deal, Dover, and Sandown castles. The Downs were the scene of a victory of the Dutch over the Spaniards in 1639, and of a naval battle between the Dutch and English in 1666.

DOWNY MILDEW. See Mildew.

DOWRY (from *dower*, AS. *dowere*, OF. *doaire*. Fr. *douaire*, Prov. *dotaire*, from ML. *dotarium*, from Lat. *dos*, dowry; connected with Lat. *dare*, Gk. *διδόναι*, *didonai*, Skt. *dā*, to give). The property which the wife brings to the husband as her marriage portion. Though recognized at the common law and often forming in England an important element in the arrangement known as a marriage settlement, it is scarcely known in the United States, except in Louisiana. There, as in most countries which have adopted the system of the civil law, it constitutes a distinct as well as an important form of property. It is given to the husband, who has exclusive control and administration of it during marriage, to be employed in defraying the expenses of the family. The wife cannot deprive the husband of its control. On the other hand, he is not allowed to alienate real estate which comes to him as dowry. In the United States and England, property so contributed by the wife to the common fund, though legally vested in the husband, may be protected by him from the claims of his creditors. Dowry is to be distinguished from dower, or the common-law right of the wife in the real estate of her husband, with which it is sometimes confounded. See Dower.

DOXOLOGY (ML. *doxologia*, Gk. δοξολογία, from δόξα, *doxa*, glory, from δοκεῖν, *dokein*, to seem + -λογια, *-logia*, speech, from λέγειν, *legein*, to say). An ascription of glory or praise to God. Brief expressions of the kind are frequent in the Bible, as Rom. xvi. 27; Eph. iii. 21; Jude 25; Rev. v. 13; xix. 1. Certain special doxologies are used in various liturgies. The Lesser Doxology, or *Gloria Patri* ("Glory be to the Father, and to the Son, and to the Holy Ghost; as it was in the beginning, is now, and ever shall be, world without end, amen") seems first to have come into use in the fourth century, as a profession of faith, in opposition to an Arian formula. It is used by the Roman Catholic Church at the end of every psalm and canticle, except the *Te Deum* and *Benedicite*, and in all the responsories of the breviary. It is omitted, however, as a song of praise unsuitable to times of mourning, on the last three days of Holy Week and in the office of the dead. The Anglican Church uses it at the end of psalms and canticles. The use of the Greater Doxology, or *Gloria in Excelsis* (sometimes called the angelic hymn, from its being an expansion of the song of the angels in Luke ii. 14), can be traced back at least to the third century. It is used in the beginning of the Roman mass, except in Advent and Lent, and at all times at the end of the Anglican communion service. The Trisagion (thrice holy) is the seraphic hymn (Isa. vi. 3). The last stanza of a hymn written by Bishop Thomas Ken (1637-1711), beginning, "Praise God from whom all blessings flow," is commonly called "the doxology" in Protestant churches.

DOYEN, dwä'yäN', Gabriel François (1726-1806). A French historical painter. He was born in Paris. After obtaining the Grand Prix de Rome (1746), he remained for several years in Italy, studying the works of Carracci, Cortona, and other celebrated masters. In 1767 he produced his celebrated painting, the "Miracle des Ardens" (Saint Roch, Paris), a work remarkable for the excellence of its drawing and coloring, whose powerfully realistic treatment shows the influence of the Flemish school. Among his best productions are: "Death of Saint Louis" (Saint Eustache, Paris); "Triumph of Amphitrite" (Louvre); "Adoration of the Magi" (Darmstadt Museum); "Diomed Fighting."

DOYLE, Alexander (1857—). An American sculptor. He was born at Steubenville, Ohio. He studied at the academies of Florence, Carrara, Rome, Milan, and Paris. His principal works include the marble monument to John Howard Payne, at Washington, D. C., the bronze equestrian statues of the Confederate Generals Johnson and Lee at New Orleans; the monument to Francis Scott Key at Frederick, Maryland; the bronze statue of Horace Greeley in New York City; and the statues of Senators Thomas Benton and Franklin P. Blair of Missouri; and John E. Kenna in the United States Capitol.

DOYLE, Sir Arthur Conan (1859—). A British novelist, born in Edinburgh, the grandson of John Doyle, the caricaturist. He studied medicine at the University of Edinburgh, and was a practicing physician from 1882 until 1890. He traveled extensively in the Arctic regions and on the west Coast of Africa. He early tried his hand at fiction and, after writing a number of deservedly unsuccessful books, he produced in 1887 *A Study in Scarlet*, in which he created the famous detective, Sherlock Holmes. Other books of his in which Holmes appears are: *The Sign of the Four* (1889); *The Adventures of Sherlock Holmes* (1891); *The Memoirs of Sherlock Holmes* (1893); *The Hound of the Baskervilles* (1902); and *The Return of Sherlock Holmes* (1904). In these stories the author displays great ingenuity, insight into character, humor, and a power of imbuing his narrative with an atmosphere of fascinating mystery, and, at times, of horror; so that the best of the stories may fairly be ranked with the similar productions of Edgar Allan Poe. Doyle also won much success by several historical novels: *Micah Clarke* (1888); *The White Company* (1890); *The Refugees* (1891); *The Great Shadow* (1892); *Rodney Stone* (1896); *The Exploits of Brigadier Gerard* (1896). *The Adventures of Gerard* (1903) is an exceedingly clever book, of which the hero is a typical *vieux moustache* of Napoleon's Grand Army. *Sir Nigel* (1906) is considered by many critics his best production in historical fiction. Volumes of short stories are: *Round the Red Lamp* (1894); *The Stark Munro Letters* (1895); and *The Green Flag* (1900). In 1898 appeared a volume of poems entitled *Songs of Action;* and in 1899 a play called *Halves*. Other works are *The Tragedy of the Korosko*, a story of the Egyptian Soudan (1898), and *A Duet with an Occasional Chorus* (1899). During the Boer War Dr. Doyle visited South Africa and acted as medical registrar of the Langman Field Hospital. Returning to England, he published a military history, entitled *The Great Boer War*, which appeared in 1900, and of which an enlarged edition was issued in 1902. Dr. Doyle also wrote a spirited defense of the British policy in South Africa, and this was widely circulated and translated into several languages. As a recognition of his services to the Government, the author was knighted in 1902.

DOYLE, Sir Francis Hastings Charles (1810-88). An English poet. He was born at Nunappleton, near Tadcaster, and was educated at Oxford. From 1867 to 1877 he was professor of poetry at Oxford. He published several books of verses, his poetic work being chiefly remarkable for his treatment of the ballad. Among his best productions are: "The Red Thread of Honor"; "The Private of the Buffs"; and "The Loss of the Birkenhead."

DOYLE, John (1797-1868). An English painter and caricaturist, born in Dublin. He studied first under Gabrielli, then at the Royal Dublin Society's schools, and afterwards under the miniature painter Cumerford. Some of his portraits were exhibited at the Royal Academy, but without much success. He then turned his attention to caricature, and also worked in lithography. For many years he contributed drawings to the *Times* signed 'H. B.,' and his identity remained unknown nearly all his life. His satire was very different from that of his coarse and violent, if vigorous, predecessors. He was always refined, never tending toward burlesque, and established what may be called a gentlemanly style of caricature. Thackeray, Macaulay, Hayden, and Wordsworth have praised his work, and his sketches throw much light on the political history of England between the years 1830 and 1845, for every man of note in political England became known through his pencil. There are more than six hundred examples of his work in the British Museum. One of his most important designs is the drawing for "The Reform Bill Receiving the King's Assent by Royal Commission" (1836), engraved by Walker and Reynolds. He also published *The Life of the Race Horse* (1822, six plates).

DOYLE, John Andrew (1844—). An English writer of American history, the son of Andrew Doyle, editor of the *Morning Chronicle*. He was educated at Eton and at Balliol College, Oxford, where he took his M.A. degree in 1868, winning the Arnold Prize Essay on the subject of *The American Colonies,* which, when published the following year, attracted wide attention as a defense of the American Revolution by an Englishman. His later works were *A History of the United States* (1875), and *The English in America*—vol. i., "Virginia, Maryland, and the Carolinas" (1882) and vol ii., "The Puritan Colonies" (1887).

DOYLE, Richard (1824-83). An English water-color painter and caricaturist. He was born in London in September, 1824, the son of John Doyle (q.v.), from whom he inherited his talent. Doyle was one of the early contributors to *Punch,* but resigned his position on the staff in 1850, because of that journal's hostile attitude toward the Catholics. He designed what has become, with slight modifications, the permanent cover of the journal. He furnished illustrations for Thackeray's *The Newcomes,* Ruskin's *King of the Golden River,* Leigh Hunt's *Pot of Honey.* The best known of his humorous stories, told in pictures, is the "Adventures of Brown, Jones, and Robinson." His work is distinguished by genial humor and graceful drawing. He also exhibited many water-colors in the Grosvenor Gallery, among which were the "Pied Piper of Hamelin" (1879); "Battle of Elves and Frogs" (1880); and the "Home of Charlotte Brontë" (1883). He died in London, in December, 1883.

DOYLES'TOWN. A borough and the county-seat of Buck's County, Pa., 34 miles north of Philadelphia, on a branch of the Philadelphia and Reading Railroad (Map: Pennsylvania, F 3). Doylestown has a public library, fine courthouse, and County Historical Society and school buildings. The industries comprise shoe factory, hosiery and worsted mills, creameries, saw and flour mills, agricultural implement works, brick and tile works, spoke factory, foundry, etc. Population, in 1890, 2519; in 1900, 3034.

D'OY'LY, George (1778-1846). A Church of England divine. He graduated B.A. at Cambridge (1800), became rector in London (1820), and was one of the principal promoters of the establishment of King's College, London. He is chiefly remembered as joint author with Richard Mant of D'Oyly and Mant's Bible, an annotated edition of the Bible published by the Society for Promoting Christian Knowledge (1814 and often since). Consult his *Memoir* by his son (London, 1847).

DÓZSA, dŏ'zhŏ, George (sixteenth century). The leader of the Peasant War in Hungary (1514). At the head of a large army (estimated by some at 60,000 men) originally designed for a crusade against the Turks, Dózsa led a rebellion in the course of which many excesses were committed. While his army lay before Temesvár, which came near falling into his hands, Dózsa was taken prisoner. His forces were dispersed and he was put to death by a series of frightful tortures. The rebellion has furnished the theme of the well-known novel by Eötvös, entitled *Magyarország 1514 ben* (1847); German translation by Dux under the title, *Der Bauernkrieg in Ungarn* (1850).

DOZY, dô'zĕ', Reinhart (1820-83). A noted Orientalist, descended from a French family settled in Holland, and born at Leyden. He pursued a course of study at the University of Leyden, and obtained the doctor's degree in 1844. Until 1850 he was at work preparing a catalogue of the Oriental manuscripts in the library. In the latter year he was made assistant professor, and in 1857 full professor of history. His first important work was published in Amsterdam (1845), under the title *Dictionnaire détaillé des noms des vêtements chez les Arabes.* In 1846 appeared the *Scriptorum Arabum loci de Abbadidis* and the *Commentaire historique sur le poème d'Ibn Abdoun par Ibn Badroun.* Among his other works are: *History of the Almohades* (1847; 2d ed. 1881); *Histoire de l'Afrique et de l'Espagne* (1848; supplement, 1883); *Recherches sur l'histoire et la littérature de l'Espagne pendant le moyen âge* (1849; 3d ed. 1881); *Al Makkari, Analectes sur l'histoire et la littérature des Arabes d'Espagne* (1855-61); *Histoire des Musulmans d'Espagne jusqu'à la conquête de l'Andalousie par les Almoravides* (1861); *Het Islamisme* (1863); *De Israëlieten te Mekka* (1864). His most important contribution to Arabic philology was his *Supplément aux Dictionnaires Arabes* (2 vols., 1877-89), which is invaluable to all students of Arabic, and is based on an exceedingly extensive study of Arabic authors of all classes.

DRA, drä. A partially dried-up river or wadi, of southern Morocco, Africa, the longest watercourse of the country (Map: Africa, D 2). It rises in numerous head-streams on the southern slopes of the Central Atlas range, and after crossing the oasis of Ed Dra flows southwest, emptying into the Atlantic just south of Cape Nun. It is only, however, by the aid of the melted snow of the Atlas summits that its waters are sufficiently increased to be enabled to reach the ocean; in the dry season its course ends a long distance from the coast.

DRACÆ'NA DRA'CO (Lat., from Gk. *δράκαινα, drakaina,* she-dragon, from *δράκων, drakōn,* dragon), or Dragon Tree. A tree of the order Liliaceæ, that produces the resin called dragon's blood. Its thickness is greatly out of proportion to its height. The head is crowned with short branches bearing tufts of sword-shaped leaves. Humboldt saw a famous specimen in Teneriffe, which at the time of his visit was 70 feet tall and 45 feet in circumference, and was estimated to be 6000 years old. It was destroyed by a storm in 1868. The Guanches worshiped it, and had hollowed its trunk into a small sanctuary. Others of large size are reported from the Canary Islands and India.

DRACHENFELS, dräG′en-fĕls (Ger., Dragon's Rock). A mountain of Prussia, in the Siebengebirge Range (q.v.), situated on the right bank of the Rhine, about eight miles southeast of Bonn, with an elevation of 1066 feet (Map: Prussia, B 3). It rises abruptly from the river, and is covered with brushwood almost to the top, whence the prospect is magnificent, extending down the river as far as Cologne, and having a charming foreground in Bonn, with its university, and numerous villages and time-worn castles. About half-way up the mountain is the cave, which, according to the legend, was occupied by the dragon slain by Siegfried. Of the mediæval castle of Drachenfels, erected on the summit of the mountain, only a solitary tower remains. The mountain, which has been extensively quarried, is the property of the State, and can be ascended by rail.

DRACHMA, dräk′ma, **DRACHM**, drăm, or **DRAM** (Lat., from Gk. *δραχμή*, *drachmē*, handful, from *δράσσειν*, *drassein*, to grasp). The name of a Greek measure of weight and of a Greek coin. The measure of weight was equal to six small bars (*ὀβολοί*) or a handful; 100 drachmas formed a mina and 6000 a talent. The weight varied somewhat in different places and at different times, but, as used in trade, seems to have been from 6 to 6.5 grams. The silver coin called drachma was the ordinary unit of the ancient Greek monetary system. Here also there were local differences; but two main systems are clearly marked—the Æginetan, with a drachma of about 6.3 grams, or frequently somewhat less; and the Euboic-Attic, with a drachma of about 4.3 grams of pure silver, or about 18 cents in the United States standard coinage. Thus, the Attic mina was worth about $18, and the Attic talent about $1080. The drachma is also the name of the monetary unit in modern Greece. Since 1867, when Greece joined the Latin Union, it has been of the same weight and fineness as the French franc. In the British system of weights there were, till recently, two drachms or drams—the avoirdupois dram, equal to $27\frac{11}{32}$ troy grains, and the apothecaries' dram (not now used), equal to 60 troy grains, or ⅛ of an ounce troy.

DRACHMAN, dräK′mån, BERNARD (1861—). An American rabbi and author, born in New York City. He graduated at Columbia in 1882, studied at Breslau, and became a rabbi in Breslau in 1885. In 1887 he was appointed professor of biblical exegesis and Hebrew philosophy in the Jewish Theological Seminary of New York, and in 1889 dean of the seminary and rabbi of the Congregation 'Zichron Ephraim.' He is one of the few American rabbis to support consistently the traditional Judaistic faith. His publications include *Die Stellung und Bedeutung des Jehuda Hajjug in der Geschichte der hebräischen Grammatik* (1885), and a translation into English of S. R. Hirsch's German work, *The Nineteen Letters of Ben Uziel.*

DRACHMANN, dräG′mån, HOLGER (1846—). Danish poet, playwright, and novelist, born in Copenhagen. He studied art but in 1877 wrote *From over the Border.* The modern movement in Danish literature dates from his *Poems* (1877), and his novels of seafaring life, *On a Seaman's Word and Honor* (1878), and *Paul and Virginia under Northern Latitudes* (1879). His poems include: *Subdued Melodies* (1878), *Old Gods and New* (1881), *Mountain Songs and Romances* (1885), *Motley Leaves* (1901). He wrote many fairy plays, including *Once upon a Time* (1885), and melodramas, *Brav-Karl* (1897), *Green Hope* (1901). Among his novels are: *With a Broad Pencil* (1887), *Prescribed* (1890), and *Daedalus* (1900).

DRA′CO (Lat., from Gk. Δράκων, *Drakōn*). An Athenian legislator. It was he who, as Thesmothete, in B.C. 621 put into written and codified form the common law of Athens. To a later age this legislation bore the stamp of severity and cruelty, it being said of the laws that they were written, not in ink, but in blood. In every case, no matter what the offense, the penalty was death. We are not, however, to assume that Draco was more severe than his age; he simply put in writing the ordinances that the archons had been accustomed to enforce without writing, and the old Attic common law, when thus reduced to writing, appeared harsh and rigorous to a milder age. Connected with the legislation was the court of appeal, the Ephetæ, judges of life and death, whose number was fifty-one. These laws, except those on homicide, were repealed by Solon. Aristotle, in the *Constitution of Athens*, speaks of Draco as being also a constitutional reformer, ascribing to him, among other measures, the following: the extension of political rights to all who were able to provide themselves with arms at their own expense, the institution of a council, or Boule, of 401 members, and the regulation of the qualifications required of aspirants for the various offices. Draco is said to have met his death at Ægina, being stifled in the theatre by the garments thrown upon him by the people as a mark of respect. Consult Holm, *Griechische Geschichte*, vol. i. (Berlin, 1886).

DRA′CO. A constellation in the Northern Hemisphere. The star γ Draconis is celebrated as the one used by Bradley (q.v.) in discovering the aberration of light (q.v.). It is a bright star, nearly in the solstitial colure, and consequently the minor axis of the small aberrational ellipse, which its apparent place describes in the heavens, lies in the meridian at its transit. Moreover, at the two equinoxes, when its apparent place is at the extremities respectively of this minor axis, it can be observed on the meridian at one equinox about sunrise, and at the other about sunset, so that both observations may be made without the interference of a too-bright daylight. These two observations, therefore, are easily taken, and the difference in the north polar distance which they give is the minor axis of the ellipse described by the apparent place of the star.

DRACONTIUM, drå-kŏn′shĭ-ŭm. See SKUNK-CABBAGE.

DRACONTIUS, drå-kŏn′shĭ-ŭs, BLOSSIUS ÆMILIUS. A Latin poet who lived and practiced as an advocate at Carthage during the latter half of the fifth century. Though his style is often spoiled by rhetorical exaggeration, his verses are framed on classical models and are of considerable merit. His extant works are two epithalamia; a collection of short epics on subjects taken from mythology; a Christian didactic poem in three books, entitled *De Laudibus Dei*, or *Hexaëmeron*, containing an account of the story of the creation; an elegiac poem, *Satisfactio*, in which he apologizes to the Vandal King, Gunthamund (A.D. 484-96), for having praised one of his enemies; and several distichs, *De Origine Rosarum* and *De Mensibus*. Owing to resemblance in style and metre, the *Orestis Tragœdia*, formerly attributed to Horace or Lucan, is now generally ascribed to Dracontius. Consult the editions of Dracontius by Arevalo (Rome, 1791), and by F. de Dulin in the *Carmina Minora* (Leipzig, 1873). The *Orestis Tragœdia* has been edited by Mähly (Leipzig, 1866), and by Schenkl (Prague, 1867). Consult, also, Rossberg, *De Dracontio* (Göttingen, 1880).

DRAESEKE, drā'se-ke, FELIX AUGUST BERNHARD (1835—). A German composer, born in Coburg. He studied at the Leipzig Conservatory under Rietz, and became a friend and pupil of Liszt at Weimar. He taught in the Lausanne Conservatory, the Royal Music School at Munich, and in 1884 became a teacher in the Dresden Conservatory. Although at first an extreme follower of Wagner, his later works are more moderate and have met with the success due them. His compositions include five operas —*Sigurd* (1867); *Gudrun* (1884); *Bertrand de Born; Merlin* (1906); *Herrat* (1892); also symphonies, quartets, a *Requiem*, etc.

DRAFT (variant of *draught*, from AS. *dragan*, Icel. *draga*, Goth. *dragan*, to draw, OHG. *tragan*, Ger. *tragen*, to carry). A popular synonym of bill of exchange, or of a check drawn by one bank on another. It is also less commonly applied to a non-negotiable order for the payment of money. Sometimes this form of draft is intended to operate as a written authority to the payee to collect the amount of the order from the drawee for the benefit of the drawer; at other times, as a voucher or warrant for payment by a disbursing officer. See BILL OF EXCHANGE; CHECK; NEGOTIABLE INSTRUMENT.

DRAFT RIOTS IN NEW YORK. A bloody disturbance which took place on July 13-16, 1863. The pressing need for more soldiers had compelled Congress to pass a Conscription Act (March 3, 1863), authorizing the President to recruit the army whenever necessary by a draft from "all able-bodied male citizens" between the ages of twenty and forty-five years. Any man, however, might, after being drafted, procure exemption from service by the payment of $300. The act was vigorously assailed as unconstitutional by the opponents of the Administration, who also asserted that the exemption clause was a flimsy device for enabling the rich to evade service. Among those who adopted and proclaimed such views was Governor Seymour, of New York State, who seems also to have represented the attitude of many prominent men in New York City. On Saturday, July 11, the draft began, without opposition, in New York at one of the enrollment offices in the strongly Democratic Ninth District. On Sunday some drafted workingmen, aided by a number of political agitators, fomented the discontent of the populace, and organized an opposition to enrollment. The draft was renewed at 10 A.M. on Monday, but the assistant provost-marshal's office was soon attacked, demolished, and burned by a furious mob, which, after overcoming a squad of police sent against it, roamed about the city, and, frenzied by excitement and drink, committed numberless outrages. The rioters, prejudiced against the negro and feeling that the draft had been occasioned by an 'abolition war,' everywhere pursued the blacks with unrelenting rancor, and brutally assaulted, tortured, and killed many that fell into their hands. The Colored Orphan Asylum was attacked, sacked, and burned, and the offices of the New York *Tribune*, one of the papers which had upheld the Administration, narrowly escaped destruction. On Tuesday the mobs, increased in number, continued to pillage, sack, burn, and kill, though in many districts they were sharply repulsed and partially dispersed by the police and militia. On Wednesday, the 15th, the assistant provost-marshal-general announced that the draft would be temporarily suspended, and militia regiments, arriving from Pennsylvania, rendered efficient service against the mobs. Large militia reinforcements arrived on the following day, and, though isolated bodies of rioters still defied the law, order was soon restored throughout the city. Before Friday morning the uprising had been suppressed. It is estimated that during these four days more than 1000 men had been killed, and property valued at over $1,500,000 had been destroyed.

On August 19th the draft was resumed, and it was completed, without further resistance, within ten days. Consult: the *Official Records*, vol. xxvii., part ii. (Washington, 1889); Fry, *New York and the Conscription of 1863* (New York, 1885); Barnes, *The Draft Riots in New York* (New York, 1863); Nicolay and Hay, *Lincoln*, vol. vii. (New York, 1890), and Greeley, *The American Conflict*, vol. ii. (Hartford, 1866).

DRAGA. Queen of Servia and wife of Alexander I., with whom she was assassinated in 1903. See SERVIA.

DRAGHI, drä'gē, ANTONIO (1635-1700). An Italian composer, born in Ferrara. In 1674 he was appointed intendant of the Court theatres of Vienna by Emperor Leopold I., and also held the post of kapellmeister to the Empress. During nearly forty-five years he produced about 175 operas, more than thirty oratorios, and various other compositions. Among his librettos was one set to music by the Emperor Leopold.

DRAG HUNT. See HUNTING.

DRAGO DOCTRINE. See CALVO, CARLOS.

DRAG'OMAN (Fr. *dragoman*, *drogman*, OF. *drogueman*, *drogeman*, *druguement*, from Ar. *tarjumān*, interpreter). A name given in the East to interpreters, and hence to the professional guides who accompany travelers and make all arrangements as a courier (q.v.) does in western Europe. The dragomans attached to the embassies in Constantinople are more or less important official personages.

DRAGOMANOFF, drä'gō-mä'nōf, MIKHAIL PETROVITCH (1841-95). A Russian scholar and littérateur. He was born at Hadyatch, in the Government of Poltava. In 1865 he was appointed lecturer at the University of Kiev, where he held the chair of general history until 1876. He criticised the educational system of Count Dmitri Tolstoy, which was based on German models of classicism, and refused to send in his resignation because of his Ukrainophil activity; but a special commission, appointed by Alexander II., found him guilty, and he was forbidden to reside in Little Russia and the capitals, or to engage in literary pursuits. The Southern Section of the Geographical Society in Kiev was abolished, and the printing of books in the Little Russian dialect was prohibited. Dragomanoff went to Geneva, where he remained until made professor of history at the University of Sofia, in Bulgaria, in 1888. For over twenty years he fearlessly combated autocracy and oppression in all its forms. A strong nationalist, he advocated a complete reorganization of Russia on federative lines, in which every nationality should possess equal and equitable representation. As he started out on the field of literary and political activity at a time when the terroristic doctrines were at their height, he stood for political execution, and justified it on the ground of necessity in view of the ultimate triumph of political liberty. His numerous works in the literary and historical field deal mostly with his native Little Russia, of which he was passionately fond. Beginning with *The Historical Songs of Little Russia*, published by him in collaboration with Professor Antonovitch, in 1874, Dragomanoff incessantly worked on the history, ethnography, folk-lore, and religious history of his country. After *The Question of Little Russian Literature* (1876), he published a series of popular pamphlets in the Little Russian dialect, and, during 1878-82, five volumes of the periodical *Hromada* (*The Commune*). His *Le tyrannicide en Russie* appeared in Geneva (1876); *La Pologne historique et la démocratie moscovite* (1881); *The Political Songs in the Ukrainian Language in the Eighteenth and Nineteenth Centuries* (Geneva, 1883-85).

DRAGOMIROFF, drä′gô-mē′rôf, MIKHAIL IVANOVITCH (1830-1905). A Russian general. He studied at the War Academy in Saint Petersburg, and became professor of tactics at that institution. After participating in the Austro-Prussian War as military attaché, he was appointed in 1868 major-general and chief of the general staff at Kiev. As commander of the Russian advance-guard, in the Russo-Turkish War of 1877-78, he distinguished himself at the crossing of the Danube at Sistova. In consequence of wounds received in the fighting at the Shipka Pass, he was compelled to retire from active service, and was subsequently appointed director of the War Academy, where he exercised a most salutary influence upon military training. He was Governor-General of Kiev from 1898 to 1903 when he entered the Council of the Empire. His works include: *Discipline and Subordination* (1894); *The French Soldier* (1897); *War is an Inevitable Evil* (1897); *Joan of Arc* (1899).

DRAGON (OF. *dragon*, Lat. *draco*, Gk. *δράκων*, *drakōn*, dragon, from *δέρκεσθαι*, *derkesthai*, Skt. *dars*, to see). In the mythical history and legendary poetry of almost every nation, the dragon appears as the emblem of the destructive and anarchic principle, as it manifests itself in the earlier stages of society—viz. as misdirected physical power and untamable animal passion striving against human progress. The earliest conception is embodied in the Babylonian myth of Tiamat—the great she-dragon—who healed the Titanic hordes of Chaos, and whose destruction by the Demiurge Merodach was the necessary prerequisite to an undisturbed and orderly universe. The destruction of the lower representatives of this disorderly element was one of the first objects of human energy, but being unattainable by merely human means, the task was assumed by that intermediate class of beings known as heroes in classical antiquity. As the highest ideal of human strength and courage, the task properly fell to Hercules (e.g. Dragon of the Garden of the Hesperides), but it was not confined to him, for we find both Apollo and Perseus represented as dragon-slayers. From legendary poetry, the dragon passed into art, some of the earliest efforts of which probably consisted in depicting it on the shield, or carving it for the crest of a conqueror's helmet. It was used in this way as a sort of Medusa, an *apotropaion* or terror-striking image. Thus it was represented on the war standards of Germanic and Dacian tribes. The dragon does not seem to have been a native emblem with the Romans, and when they ultimately adopted it as a sort of subordinate symbol, the eagle still holding the first place, it seems to have been in consequence of their intercourse with other nations. Among all the new races which overran Europe at the termination of the classical period, the dragon seems to have occupied nearly the same place that it held in the earlier stages of Oriental and Greek life. In the *Nibelungenlied* we find Siegfried killing a dragon at Worms; and the contest of Beowulf (q.v.), first with the monster Grendel, and then with the dragon, forms the principal incident in the curious epic which bears the name of the former. Even Thor himself was a slayer of dragons. Among the Teutonic tribes which settled in England it was from the first depicted on their shields and banners, as it was also in Germany. Nor was the dragon peculiar to the Teutonic races. Among the Celts it was the emblem of sovereignty, and as such borne as the sovereign's crest. Tennyson's *Idylls* have made every one familiar with 'the dragon of the great pendragonship,' blazing on Arthur's helmet, as he rode forth to his last battle, and 'making all the night a stream of fire.'

Christianity inherited the Oriental idea of the dragon, which is made the emblem and embodiment of the devil. In Saint John's Apocalypse, in fact, in all apocalyptic literature, it plays an important part. That Christ should 'tread on the lion and the dragon' was an idea handed down from the Old Testament. In later Christian traditions Saint Michael is the chief opponent of the infernal, and Saint George of the terrestrial dragon. The dragon in a cave on Mount Socrate represented paganism, and his defeat by Pope Sylvester symbolized the triumph of Christianity under Constantine. In Christian art the dragon is the emblem of sin, the usual form given to it being that of a winged crocodile. It is often represented as crushed under the feet of saints and martyrs. Sometimes its prostrate attitude signifies the triumph of Christianity over paganism, as in pictures of Saint George and Saint Sylvester; or over heresy and schism, as when it was adopted as the emblem of the knights of the Order of the Dragon in Hungary—an Order instituted for the purpose of contending against the Hussites of Bohemia.

The dragon is often employed in heraldry; and other animals, such as the lion, are sometimes represented with the hinder parts resembling dragons. Consult Mähly, *Die Schlange in der Kunst* (Basel, 1867). See GRIFFIN.

DRAGON. The name now applied to various lizards. One is a South American tree-lizard (*Thorictis drachœna*), both the eggs and flesh of which are eaten. Others are members of the iguanid genus Callisaurus, several species of which are common in southern California and southward. The name most commonly belongs, however, to the arboreal flying lizards of the genus Draco of the East Indies. They are distinguished from all the other living lizards by having horizontally spread-out folds of skin, supported by five or six false ribs, which do not encircle the body, but stand out at right angles from it, forming a parachute, which buoys up the lizard in its extremely swift bounds from limb to limb in pursuit of insects, for it does not possess the power of true flight. When at rest, the ribs and skin are folded back along the sides of the body, and do not interfere with active running about. About twenty species are recognized, none more than eight inches long, but they keep in the tops of the forest trees, and little is known about them. The most familiar is the Malayan one (*Draco volans*), which is of a brilliant but variable metallic hue above, varied by bands and spots, while the parachute and the throat appendage of the male are orange. Similarly brilliant colors belong to the other species, yet little is seen of them, except when the creature is excited and displays itself in anger or courtship. The dragon has no power of changing its colors, is perfectly harmless, and is frequently kept as a tamed pet.

DRAGONADES (Fr., from *dragon*, dragoon, so called either from their firearm, which was ornamented with the head of a dragon, or from their standard, which bore a dragon). The name applied to a series of religious persecutions in France, which was inaugurated shortly before the revocation of the Edict of Nantes (1685), and continued for some time. Louis XIV.'s Minister of War, the Duc de Louvois, was responsible for the cruel measures taken to compel the Protestants to renounce their faith and enter the Roman Church. Armed expeditions marched through the provinces demanding of the Huguenots in the small towns and villages that they should abjure their faith. Foremost among the armed force rode dragoons, who, on account of their barbarity, had the unenviable honor of giving a name to the persecutions. It was the custom to quarter the dragoons in the houses of those Huguenots who showed themselves particularly obstinate in denying the doctrines of Catholicism. The outrages committed by a brutal soldiery, free from all restraint, and, in fact, encouraged in their licentious conduct, made life with honor impossible for the Huguenots and drove thousands of families out of the country or into the bosom of the Church. Louis was delighted to find that from two hundred and fifty to four hundred Protestants were being converted daily, and in consequence, on October 22, 1685, a few months after the date of the first of the persecutions, he revoked the Edict of Nantes (q.v.), that the good work might be fully accomplished. Under Louis XV. the dragonades were renewed by the chief minister, the Duc de Bourbon. Consult: Rousset, *Histoire de Louvois* (4 vols., Paris, 1863); Tylor, *The Huguenots in the Seventeenth Century* (London, 1892); Perkins, *France Under the Regency* (Boston, 1892); Baird, *The Huguenots and the Revocation of the Edict of Nantes* (New York, 1895).

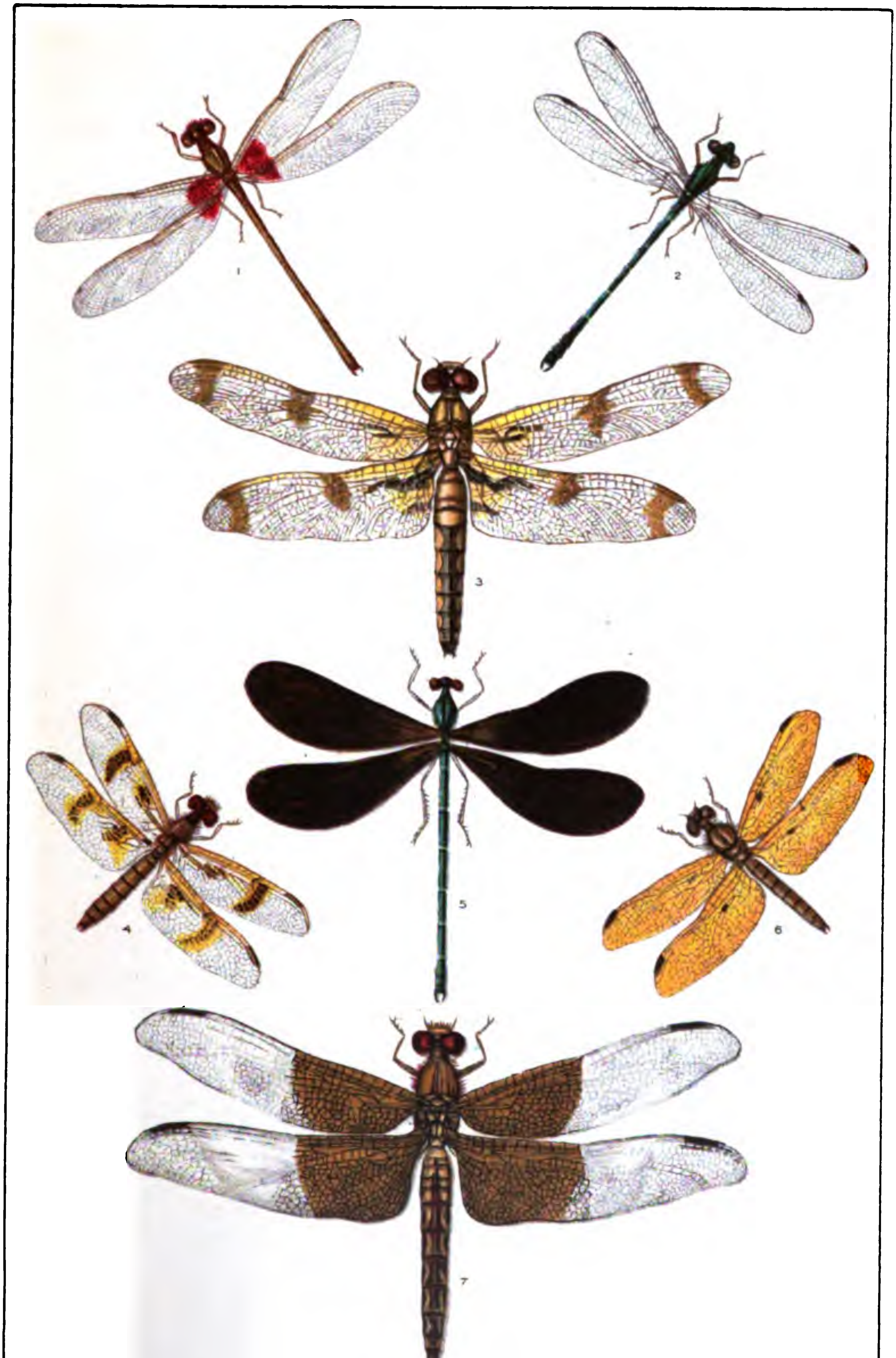
DRAGONET (OF. *dragonet*, diminutive of *dragon*, dragon). A fish of a genus (Callionymus) usually classed with the gobies, but by some authors given separate family rank. They are remarkable for having the gill-openings reduced to a small hole on each side of the nape, and the ventral fins placed under the throat, separate, and larger than the pectorals. They have no air-bladder. The species are pretty numerous, mainly inhabitants of the temperate coasts of the Old World, but some living in Oriental tropical seas, and of brilliant and quaint appearance. The sexes differ greatly, the adult males having the fin-rays produced into filaments, and the intervening membranes highly colored, especially in the breeding season, whereas the females wear a more sombre dress. Hence the beautiful British species, the gemmeous dragonet, or yellow sculpin (*Callionymus lyra*), was formerly considered two species, one of which was finally discovered to be the female of the other. They feed upon small shellfish.

DRAGONETTI, drä'gô-nĕt'tê, DOMENICO (1763-1846). A noted Italian double-bass player, born in Venice. He studied double-bass playing under Berini, a member of the band at San Marco, was admitted to the orchestra of the Opera Bouffe in 1768, and in 1769 to that of the Opera Seria. In 1773 he succeeded Berini at San Marco. He went to London in 1794, at once gained fame, and thenceforth resided chiefly in England. He was in 1808-09 in Vienna, where he had also visited his friend Haydn in 1798; but during that time he refused to play in public, for fear of being hustled off to Paris by Napoleon as a valuable acquisition. His title of 'patriarca del contrabasso' was not merely honorary; for in 1845; at the age of eighty-two, he headed the thirteen double-basses at the Beethoven festival in Bonn, and won high commendation from Berlioz. As a performer he has probably never been excelled. His instrument, a da Salo, bought at the San Pietro monastery, Vicenza, he presented to the vestry of San Marco, and to the British Museum he gave 182 bound volumes of the scores of classical operas. He published little.

DRAGON-BIRD. (1) A name given to the umbrella-bird (q.v.), in allusion to the shape of its crest, which resembles the ornamental top of the helmet of a dragoon of the eighteenth century. (2) An Australian ant-thrush (*Pitta strepitans*).

DRAGON-FISH. One of several small gurnard-like fishes of the genus Pegasus, inhabiting Oriental and Australian seas. Its body is covered with bony plates, which are movable except near the tail; and the pectoral fins are large and fan-like. The eyes are very prominent, and the snout greatly prolonged and tooth-

DRAGON-FLIES



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH N.Y.

1 RED-SPOTTED DAMSEL-FLY – HETÆRINA AMERICANA
2 GREEN-BODIED DAMSEL-FLY – LESTES EURINA
3 BANDOO DRAGON-FLY – LIBELLULA SEMIFASCIATA
4 THE AMBER-WING (FEMALE) - PERITHEMIS DOMITIA
5 THE BLACK WING - CALLOPTERYX MACULATA
6 THE AMBER=WING (MALE) - PERITHEMIS DOMITIA
7 THE BASAL DRAGON-FLY-LIBELLULA BASALIS

ALL NATURAL SIZE

less. A common Indian species is *Pegasus draco*, and another species (*Pegasus volans*) is frequently seen dried as a curiosity or serving as an ornament on boxes, etc., made in China. Little is known of their habits.

DRAGON-FLY. Any amphibious insect of the order Odonata. These insects possess numerous popular names, such as snake-feeder, horse-stinger, spindle, devil's darning-needle, and mosquito-hawk. They have very large heads, due to the excessive size of the eyes; the antennæ are short and the biting mouth-parts are powerful; the four wings are of similar size and structure; the legs are long and used for perching rather than for crawling. Two distinct types of dragon-flies are now recognized: (1) Zygoptera, whose wings, in repose, are held upright; and (2) Anisoptera, whose wings are held horizontal. To the former group belong our common slender-bodied blue forms sometimes called damsel-flies, while to the latter belong our larger and usually more sombre species. Both kinds are most frequently found about ponds, marshes, or streams, but some forms go a considerable distance from water, in meadows, in sunny hours, where they hawk for small insects with exceeding speed and voracity. The Zygoptera fly nearer the ground and more among vegetation than do the Anisoptera. Dragon-flies are known to swarm, both in America and in Europe, but the causes of these migrations are unknown. Although harmless, these insects are much feared by persons unacquainted with them, which explains some of the strange names and accounts for the quaint beliefs that exist among the country people, who say that if a 'darning-needle' gets into your hair most disagreeable things will happen, the least of which is the sewing up of the ears. The folk-lore of Europe, the Orient, and Japan abounds in superstitions and sayings in regard to these quite innocent but fierce-looking insects.

The reproductive habits of dragon-flies are unique, in that there is no direct transference of the sperm from the genital ducts to the female, as in other insects. The sperm, previous to the transference, is stored in an accessory receptacle near the base of the male abdomen. The clasping attitudes are also peculiar. The male grasps the neck of the female by means of a pair of forceps at the end of the abdomen, the female then bends forward the apex of her abdomen to the accessory sperm-receptacle near the base of the male's abdomen, and thus the actual transference of the sperm takes place. Among the Zygoptera the pairs often fly about tandem-like, the male clasping the neck of the female; and in some species the male may even retain his hold and accompany her when the female crawls beneath the surface to oviposit. The females which go beneath the surface are those which oviposit in the tissues of plants. In some dragon-flies the eggs are dropped or washed off of the abdomen by dipping it into the water or striking it upon the surface. Larvæ of Odonata are called 'nymphs,' and are aquatic and carnivorous. The lower lip is greatly developed and forms a powerful grasping organ. The zygopteran nymphs have three plate-like gills at the end of the abdomen, while in the anisopteran nymphs respiration takes place in the greatly modified posterior part of the intestine into which water is drawn, and may be expelled with force sufficient to aid in locomotion. In the zygopteran genera Euphæa and Anisopleura the nymphs also possess, in addition to the terminal gills, lateral abdominal gills. Certain kinds of nymphs show decided preferences for certain habitats, some choosing standing water, others small streams, and still others rapid water. These preferences are as marked as in the case of the particular places frequented by the adults.

When a nymph is fully grown it crawls out of water and attaches itself, by means of its claws, to some support. The nymph-skin then splits along the top of the head and down the back, and through this rupture the imago escapes. At first the body and wings are limp and contracted, and only gradually expand to their full size; but the adult colors do not appear for several hours, or even days, after emergence. The duration of the life of the imago varies from about three to six weeks for many forms, but in the case of those few forms which hibernate the limit may even extend over six months.

While the dragon-fly, on account of its preying upon small insects and mosquitoes, is considered beneficial, the nymphs, on the other hand, have been credited with destroying young fish in hatcheries. While small insects doubtless form the bulk of their food, the larger species do not hesitate to attack even wasps and butterflies.

The greatest extremes in size are found among the slender-bodied Zygoptera. The smallest is a Javanese species (*Agrioenemis minima*), whose abdomen is about half an inch long, and the largest is *Megaloprepus cœrulatus*, from Central America, whose abdomen is about four inches long. A very large anisopteran (*Gynacantha plagiata*), from Borneo and Sumatra, has an abdomen nearly equal to the latter in length.

About 2000 species of Odonata are known, the most of which are from tropical countries; but about 300 species occur in North America.

Fossil dragon-flies, of which at least 75 species have been described, appear first in the Lias, where they present already a considerable differentiation, the majority of subfamilies being represented in the rocks of that period. In the Jurassic limestones of Solenhofen, Bavaria, occur numerous examples, mostly of extinct genera, that are often preserved in the finest manner, with the wings spread out. Dragon-flies are also found in all the Tertiary insect-bearing beds, and the larvæ and pupæ occur in great abundance at Oeningen, Germany. See NEUROPTERA.

See DAMSEL-FLY and Plate of DRAGON-FLIES and DAMSEL-FLIES.

DRAGON LEECH. See LEECH.

DRAGON OF WANTLEY, THE. A ballad, apparently a parody on the old romances, which appears in Percy's *Reliques*. The dragon, who lives in a well, is killed by the hero, More of More Hall, clad in a suit of spiked armor.

DRAGON'S BLOOD (so called on account of the color), or GUM DRAGON. An astringent resinous substance obtained from several trees of different natural orders, growing in warm countries. The greater part of the dragon's blood of commerce is produced by the *Calamus draco*, growing in the East Indies, the resin being attached in the form of hard, brittle masses to the fruits of the tree. Two varieties of dragon's blood occur in commerce. One variety is brought in the form of sticks, the other in the form of cakes. The separation of the resin from the fruits is effected either by shaking the latter in large bags or by boiling them in water.

American dragon's blood is derived from the Pterocarpus draco, and similar resins are produced by the Dracæna draco, the Croton draco, and the Eucalyptus resinifera. True dragon's blood is a colorless and tasteless substance melting above 80° C.; American dragon's blood is opaque, of a deep reddish-brown color, brittle, smooth, with a shining shell-like fracture, and when burned emits an odor resembling that of benzoin. It is nearly insoluble in water, but is soluble in alcohol, benzene, carbon disulphide, and many oils. It was formerly used in medicine; at present, however, it is employed in the preparation of varnishes and lacquers and in photo-engraving processes.

DRAGON'S MOUTH (Sp. *Boca del Drago*). A short strait on the coast of Venezuela, South America, which connects the Gulf of Paria with the Atlantic, and separates the north end of the island of Trinidad, on the east, from the Paria peninsula on the west (Map: West Indies, Q 9).

DRAGON-TREE. See Dracæna Draco.

DRAGOON′. See Cavalry and Mounted Infantry.

DRAGUIGNAN, drȧ'gē'nyäN'. The capital town of the Department of Var, France, on a tributary of the Argens, 40 miles northeast of Toulon (Map: France, N 8). It is situated in a valley surrounded by hills, the slopes of which are covered with vineyards and olive plantations. Its principal buildings are the prefecture, the court-house, a hospital, and a museum containing pictures by Rembrandt, Teniers, and Panini. It has manufactures of coarse woolens, leather, hosiery, silks, soap, brandy, oil, and earthenware. Population, in 1901, 9671. The town was founded in the fifth century. During the Middle Ages it was strongly fortified. The fortifications were destroyed in the civil wars, but were reconstructed in 1615. It replaced Toulon as the capital of the department in 1793.

DRAINAGE. In law, a right to discharge surface water from one's land upon the land of another. The civil law of Rome recognized a natural right of drainage as between adjacent lands of different elevations, the rights of the owners of such lands being governed by the law of nature. By that law, which has been adopted in Pennsylvania, Illinois, California, and Louisiana, the lower proprietor is bound to receive the surface waters which naturally flow from the estate above, provided the servitude has not been increased by the industry of man.

No such right exists by the common law, and it is held in most of the United States, as well as in England, that the lower proprietor may lawfully obstruct the flow of surface water upon his land from that of his neighbor, though the latter is not liable for any damage which may result from the natural flow of such water upon the lands of the former. In both systems of law, however, a riparian proprietor may drain his land into a natural watercourse which flows over or by his land, and no obstruction of the stream by the lower proprietor which prevents such drainage will be permitted. This is a natural, as distinguished from an acquired, right of the riparian proprietor, and is therefore strictly analogous to the natural servitude of drainage of the civil law above alluded to. It exists *ex juræ naturæ* and is incapable of alienation, of release, or of severance from the land. See Barkley *vs.* Wilcox, 86 *New York Reports*, 140.

Apart from this limited natural right of drainage, the common law recognizes also an easement of drainage, which may be acquired by grant or prescription over the land of another. This may exist with or without an artificial construction, and may be superficial or subterranean. The common-law right of eavesdropping is one form of this easement, though its usual form is the right to construct and maintain an artificial drain and to discharge water through the same into and through the adjoining premises. The familiar right of the householder in a city or village to discharge water into a public or municipal drain is of this nature. The right is violated by any interference or obstruction caused by the owner of the lower or 'servient' estate, whether intentional or not, and may be enforced by an action for damages or by injunction to prevent a threatened interference. The easement carries with it the right to enter on the premises affected by it in order to repair the drain and keep it open; but it is, like other easements, carefully restricted to the amount and kind of user included in the terms of the grant. See Easement; Servitude; Watercourse; and the authorities there referred to.

DRAINAGE (from *drain*, AS. *drehnian, dreahnian, drēnian*, Icel. *dragna*, from AS.. Goth. *dragan*, Icel. *draga*, OHG. *tragan*, Ger. *tragen*, Engl. *draw, drag*). The removal of surplus water from the soil by means of canals, open ditches, and drains, or other conduits which are either porous or else laid with open joints. In its larger sense the term drainage applies to the reclamation of extensive areas of land either under water or in the condition of marsh or swamp, and consequently unfit for habitation or cultivation. In agriculture drainage implies the removal of surface or subsoil water from a more limited area which it is desired to put under specific cultivation, and generally is understood to involve the use of tile drains, as will be described below. The name drainage is also used to denote a system of sewerage for the removal of liquid household wastes, as well as the surface and subsoil water of towns and cities. This aspect of the subject will be found treated fully under the head of Sewerage and Drainage.

Reclamation of Land. In reclaiming large tracts of land, often of great fertility, but which are at so slight an elevation above the sea or the neighboring streams that they can be rendered fit for cultivation and habitation by artificial means only, dikes or embankments are constructed to keep out the flood waters and a system of canals built to collect and carry off the superfluous water. In the case of marsh lands the method employed depends upon the elevation and conformation of the land to be drained, but all lands may be divided into two general classes—those that can be drained by gravitation and those in which the water must be pumped out, either all or a part of the time. Many coast lands are so low that the water will run off only at low tide, and such lands are protected from high tide by embankments. The water is gathered by a network of subsidiary ditches into a few main drains, which discharge their contents into the sea at low tide, while the tidal flow is kept out by automatic doors or sluices. The problem of draining low lands by gravity is an increasingly difficult one, because a section that is drained tends to sink, through shrinkage, below its former level. Hence it happens, as in East Lincolnshire, England, that land which at first was drained effectually by gravity afterwards, through subsidence, required pumping to carry off the water. Much of the land that has been most successfully reclaimed from encroaching waters has been so low that it required pumping to carry the drainage off during a whole or a part of the year. This is particularly true in Holland. Many other considerations, besides the actual level of the land to be drained, must be taken into account in devising a system of drainage for low lands. The object sought in laying out drains in a flat country is to provide channels of the least possible area, depth, and inclination that will suffice to carry off the water properly. Every increase beyond this point is a waste of land and of expense in excavation; and where pumping is necessary, the greater the inclination or grade of the canal, the higher will be the lift. Usually a much greater area must be devoted to ditches when the land is drained by gravity than by pumping, so that the increased expense for constructing and maintaining ditches will sometimes equal the cost of installing and operating pumps.

In determining the number and capacity of drains required, the local rainfall and the absorbent power of the soil must be taken into account. Low areas, surrounded by higher land, often have not only the rainfall on their own area, but also the drainage from the surrounding country to be provided for. This is prevented, whenever practicable, by separating the low land from the surrounding country by a catch-drain (q.v.). Care should be taken that the subsidiary ditches or drain-pipes do not discharge into the main canal at a point below the water-level of the latter, for if this happens, the free circulation of air through the soil by means of the drains is impeded and there is danger that the water will back up. Drainage canals should be kept free from weeds, for their growth impedes the flow of water, by decreasing the area of the ditch and by increasing the friction of the running water. Various machines have been devised for cutting the growth of weeds in ditches and for digging them out by the roots. Having considered some of the most general principles underlying the construction of a drainage system, a few of the most important examples of land reclamation will be described.

One of the best-known and most extensive systems of land reclamation is found in Holland. Here the greater part of the country is low and flat, and is protected from inundation by an enormous system of dikes. The soil was originally marshy and the territory included numerous lakes. By an elaborate and scientific system of canals many of these marshes and lakes, now called *polder-land*, have been drained and converted into fertile soil. (See POLDER.) The most famous of these polders is the former site of the Haarlem Lake, where a population of nearly 20,000 people are now dwelling. Another of these polders is the Biesbosch.

The Haarlem Meer was formed in the sixteenth and seventeenth centuries by the junction of several small lakes. Three villages were covered with water, the last in 1647, and much otherwise valuable territory was rendered useless. Of the various early plans for relief, one proposed by Leeghwater, in 1643, contemplated an embankment around the whole area, and 160 windmill-driven pumps, with an estimated cost of about $1,500,000. In 1836 the Meer was extended still further, and in 1837 work was begun for the reclamation of 44,724 acres of land, covered with some thirteen feet of water. An embankment 37½ miles long was built around the lake, and a canal then in existence was improved and extended, partly for navigation. It was decided to use steam-power for pumping. There were three engines in all, the last two erected being similar to the other, but having a 73-inch pump cylinder.

The first engine lowered the lake six inches in about ten months, after which it took the three engines 39 months to complete the work.

Previous to the year 1892 a commission was appointed to investigate a project for draining the Zuyder Zee, and the plan presented to the government in 1901 was based on its report.

The Zuyder Zee forms an arm of the North Sea, and was created in the year 1170 by a severe storm breaking down the sand dunes along the coast and inundating the land for a distance of sixty miles.

It was proposed to enclose the inner part of the Zuyder Zee by an embankment, 18 miles long and as many feet high, from Wierengen to Piaam, with 4 other enclosing banks to enclose as many areas which were to be pumped dry. This would leave an inland sea of 560 square miles surrounding these areas and cut off from the North Sea by the above-mentioned dike, whose elevation would be lower than that of the exterior water. The Yessel River would empty into this and the inland lake in turn would empty by sluices through the dike into the North Sea. The estimated cost of the completed plans was about $79,000,000, and it was expected to take 33 years to complete. The area thus reclaimed would be about 480,000 acres, with a net renting value of $10 an acre, giving a revenue of $316,000 a year after paying interest and principal.

With the exception of Holland, the Fenland of England is a region where the science of drainage has probably been applied to the improvement of land on a larger scale than in any other part of the world. The district known as *The Fens* is a tract of flat and marshy land on the east coast of England, having an area of about 400,000 acres. The whole region was, centuries ago, converted into an unprofitable marsh by repeated incursions of the sea, coupled with obstructions to the outward flow of the rivers Nene, Cam, Ouse, Welland, etc. Vast operations have been carried on ever since the time of Charles I., by digging new channels and outfalls, and employing windmills and steam-engines to pump the water from the marshes and ponds into these artificial channels. The region is divided into the *North*, the *Middle*, and the *South Levels*, managed by commissioners, whose powers are derived from special acts of Parliament. The improved value of the land is the fund out of which the expense of the engineering works is defrayed. It was in one of these districts (the Middle Level, between the

Nene and the Old Bedford rivers) that an irruption took place in 1862, which strikingly illustrates the dependence of the safety of the whole region on well-formed and well-maintained embankments.

There was a sluice, called Saint Germain's sluice, situated at the confluence of the Middle Level main outfall drain with the River Ouse, near the upper end of another artificial channel, known as the Eau Brink cut. On May 4, 1862, this sluice gave way without the slightest warning; the tidal waters undermined the brickwork, and formed a hole in the bed of the river, into which the works of the sluice sank. The tidal waters rushed up the opening, and ebbed and flowed throughout a distance of 20 miles. An attempt was made to throw an earth and cradle dam across the drain, at about 500 yards from the fallen sluice; but this was relinquished in favor of a permanent coffer-dam of pile-work, at a distance of half a mile from the sluice; and after incessant exertions from May 16 to June 19, the tidal waters were at length effectually shut out by a strong dam. The failure of the Saint Germain's sluice was not the only irruption that had to be battled with; eight days after that failure, under the pressure of a high spring-tide, the west bank of the drain gave way, on May 12, at a point about four miles from the sluice; the bank had been built only to resist upland waters and not a rush and a pressure of the sea. The rupture carried away 70 yards of the bank, scouring out a hole 10 feet deep at the spot, and admitting a rush of water which covered 6000 acres of fertile land to a depth of two or three feet, increased at successive high tides to 10,000 acres.

In completing the repairs, it was decided to substitute syphons for sluices to carry off the water, but these, after being operated a number of years, have been abandoned in favor of a new sluiceway. The attempt to carry off the water from the fen-lands by gravity has in no instance proved completely successful. Pumping plants have therefore been installed here and there, to carry off the water, either constantly, or at flood seasons.

In the valley of the Po, 600,000 acres of marsh-land have been drained and transformed into rich farm-land, the water being lifted off by pumps. The same kind of work has been done in the south of France.

In America, a large amount of land-reclamation work, by gravity-canal systems, has been accomplished in Florida, Illinois, Indiana, and Minnesota. Two drainage canals have been constructed in the Red River Valley of Minnesota, which have reclaimed 250,000 acres of land.

Florida, with its fertile soil and subtropical climate, offers a wide field for land reclamation, for it is estimated that, out of a total area of 58,680 square miles, 4400 square miles are water surface, and 14,000 more are swamp lands. The swamp lands are of different kinds. There are (1) those bordering rivers and subject to the rise and fall of the latter, which in most cases can only be drained by constructing embankments and pumping; (2) large morasses near the sources of rivers, which, being at the head-waters of the streams, can be drained by gravity; (3) large shallow ponds, which, when drained or in dry seasons, become fertile prairies. Thus far the work done has chiefly consisted in digging shallow gravity canals, and in widening and deepening existing channels. Within the limits of the city of Philadelphia, Pa., several thousand acres of cultivated land lie below the tide levels of the Delaware and Schuylkill rivers, protected from inundation by at least 200 miles of surrounding dikes and drained by numerous canals and ditches.

Various schemes have been proposed for draining the New Jersey and Staten Island marshes. These embrace an area of about 45,000 acres in the Borough of Richmond, New York City, and in New Jersey, and extend for about thirty-five miles from Perth Amboy to Hackensack.

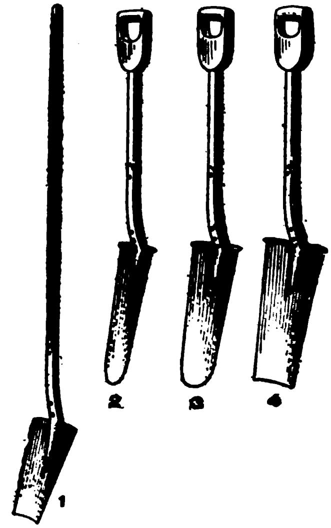
These general plans of reclamation have been suggested: (1) That the land be elevated by material secured by excavating drainage canals through it; (2) That the same elevation be accomplished by filling in with borrowed material; and (3) that a dike be built along the shoreline and the marshes be drained by tide gates.

The cost of the first would be about $25,000,000, of the second $150,000,000, and about $4,000,000 for the third, with a charge of $200,000 a year for maintenance and pumping.

In 1904, it was suggested that the same end be secured by the construction of two dams, one at Perth Amboy—Tottenville—and the other at Port Richmond—Bergen Point—to prevent the tide from backing up into the meadows, and thus keeping the elevation of the water behind the dams something a little above low tide. This would have the same effect as a filling in to a depth of about 45 feet, and would cost very much less than either of the other systems.

Consult Wheeler, *The Drainage of Fens and Lowlands by Gravitation and Steam Power* (London, 1888). For drainage and sewerage of cities, see SEWERAGE.

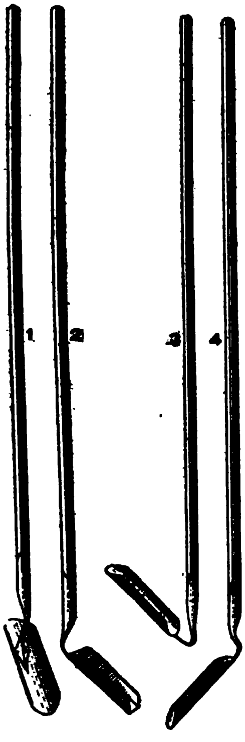
DRAINAGE OF FARM-LANDS. The earliest method of freeing land from superfluous water was by open ditches and drains, but throwing up the land in beds, hilling, and ridging were practiced with the same object in view. These, however, are only partial and superficial in their effects. The Roman agricultural writers mention the good results arising



No. 1, long-handled shovel for loose earth; 2, 3, 4, spades for digging the ditch.

from covered drains, which were formed of stone, wood, or other substances. Cato, who wrote in the second century B.C., gave specific directions for drainage. The art of drainage was understood and practiced at a much earlier date by the Egyptians and Babylonians. Primitive methods were also practiced to a limited extent in early days in Great Britain, and on the Continent of Europe. The progress of draining, however, was slow and partial until well on in the nineteenth century, when the practice was reduced to a system.

Practical men consider the line of greatest fall, or quickest descent, the best for cutting drains in a field. A fall of at least one inch in 100 feet should be secured, if possible. The most efficient system of drains can be laid out only after careful leveling (q.v.) of the land to be drained. The smaller drains usually open into larger or main drains, which are laid in the lowest ground, instead of each discharging its quota of water into an open ditch. This is rendered necessary as the mouths of the smaller drains would be more liable to be choked up by the growth of weeds; while the collecting of water into main drains secures a fuller flow to sweep out any matter which might accumulate where the discharge is small. Moreover, the less the action of the air in the drains, the more efficient they are. The most efficient and at the same time the cheapest drain is made so that a pipe of cylindrical form may be laid along the bottom, which need be of no greater width than is necessary to allow of the pipes being properly laid. Drains of this form are cut with a set of spades, which are of different widths—the broader implements being used for taking out the top, and the narrower for the bottom. The implement which prepares the bottom of the drain for the tile is called a draining-scoop, of which there are a variety of forms. Various forms of machines adapted to digging ditches for underground drains are found in the market. Before the general use of pipes, stones were the common materials with which drains were formed. It was recommended that they should be broken so as to pass through a ring two inches and a half in diameter. From nine inches to a foot in depth was the quantity which was commonly put in. When tiles and pipes were first used, it was even thought necessary to have some gravel, or small stones, placed above them in the drains, for the purpose of enabling the water to find its way into them. It was soon found, however, that tile drains were quite as efficient without any stones or gravel; and that they were less liable to be choked up, as the clay or earth acted as a filter in preventing the intrusion of any kind of solid matter. Many kinds of tiles and pipes have been tried, but the cylindrical form is most used. At one time a bore of one inch diameter in the tile was thought sufficient, but tiles of three to four inches are now preferred. They are usually made 12 or 15 inches in length. The continuity of the drain is sometimes maintained by collars, but these are expensive and are not considered necessary. In soft or clayey subsoil semi-cylindrical tiles have been laid with the bend up, but this is rarely, if ever, necessary. The size of the tile required depends on the size of the area to be drained. Waring gives the following directions for average conditions. With drains 4 feet or more in depth, laid on a uniform fall of 3 inches in 100 feet: For 2 acres, 1¼-inch pipes; for 8 acres, 2¼-inch pipes; for 20 acres, 3½-inch pipes; for 40 acres, two 3½-inch pipes; for 50 acres, 6-inch pipes; for 100 acres, 8-inch pipes. Elliott gives the following tables, based on Kutter's formula, for determining the number of acres a tile of given diameter and per cent. of grade will drain. They are applicable to main drains, well laid, where the water is supplied to them by sub-mains and laterals. Table 1 gives the discharge in cubic feet per second for sizes of tile-drains from 4 inches to 20 inches in diameter, computed on a grade of 1 per cent., or 1 foot per 100. Table 2 gives the square roots of grades from 0.04 foot per 100 feet to 1 foot per 100 feet:



FINISHING TOOLS.

1, groove-maker for round tile, operated by pushing; 2 and 4, the same for hexagonal tile; 3, groove-maker for round tile, operated by drawing.

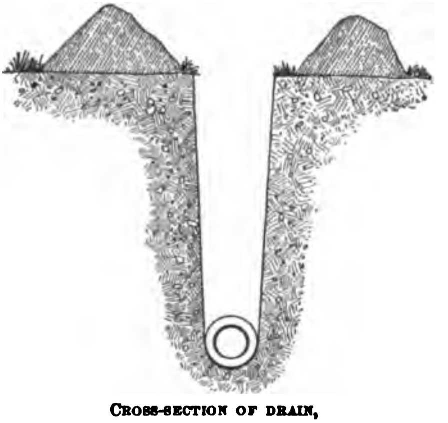
TABLE 1.—DISCHARGE OF TILE FROM 4 TO 20 INCHES IN DIAMETER ON A GRADE OF 1 FOOT PER 100 FEET

Diameter of tile in inches	Discharge in cubic feet per second	Diameter of tile in inches	Discharge in cubic feet per second
4	0.16	10	2.05
5	.31	12	3.40
6	.49	15	6.29
7	.72	18	10.37
8	1.11	20	13.85
9	1.53		

TABLE 2.—GRADES PER 100 FEET, AND THEIR SQUARE ROOTS

Grade per 100 ft. in feet	Grade in inches (approximated)	Square root of grade	Grade per 100 ft. in feet	Grade in inches (approximated)	Square root of grade
0.04	½	0.200	0.35	4¼	0.592
.05	⅝	.224	.40	4¾	.632
.06	¾	.245	.45	5⅜	.671
.07	13/16	.265	.50	6	.707
.08	⅞	.283	.55	6⅝	.742
.09	1	.300	.60	7¼	.775
.10	1⅛	.316	.65	7¾	.806
.12	1⅜	.346	.70	8⅜	.837
.14	1⅝	.374	.75	9	.866
.15	1⅞	.387	.80	9⅝	.894
.16	2	.400	.85	10¼	.922
.18	2⅛	.424	.90	10¾	.949
.20	2⅜	.447	.95	11¼	.975
.25	3	.500	1.00	12	1.000
.30	3⅝	.548			

To determine the number of acres that a tile main of given size and grade will drain, multiply the discharge of the tiles, according to size, as given in Table 1, by the square root of the grade upon which it is proposed to lay the main, as found in Table 2. When it is desired that the main shall carry 1 inch in depth per acre in twenty-four hours, multiply this result by 24; if one-half inch, multiply by 48; if one-fourth inch, multiply by 96.



CROSS-SECTION OF DRAIN,
Showing tile in place.

There is much difference of opinion as to the proper depth and distance apart of drains. Smith, an early worker in this field, at first advocated placing the drains from 2½ to 3 feet deep, and at intervals of from 10 to 40 feet according to the nature of the land. Experience, however, has been gradually favoring deeper drains, beyond the reach of plant-roots, and at wider intervals. Even on the most tenacious soils, with subsoils of till, few now think of having drains less than 3 feet in depth, though the distance apart should not in many cases be more than from 25 to 30 feet. The depth, however, depends greatly on the soil—3½ and 4 feet, with the leader drains 6 inches deeper, are common dimensions. In peaty land the depth has sometimes to be 7 feet. The width between drains depends on the wetness of the land and the character of the subsoil. King states that "in loose, loamy soils, and especially if underlain by sand, good drainage will be secured with drains 100 feet apart and 3½ feet deep. On heavier soils, they must be closer." The following table, given by Parkes, may be studied with profit in this connection:

MASS OF SOIL DRAINED FOR DIFFERENT DEPTHS AND DISTANCES OF TILE

Depth of drains	Distance between drains	Mass of soil drained per acre
Feet	*Feet*	*Cubic yards*
2	24	3,226⅓
3	33⅓	4,840
4	50	6,453

The principal advantages of drainage of ordinary farm-lands are: (1) The removal of stagnant water, the presence of which favors the formation of chemical compounds injurious to crops, keeps the land cold by evaporation, and delays not only plowing, planting, and subsequent tillage operations, but harvesting; (2) the deepening of the surface stratum of friable soil, with the consequent increase of feeding ground for the roots of plants, and the increased capacity of the soil to absorb rains and manures and to retain them and also capillary water during the summer. Drainage is also one of the most efficient means of removing excess of soluble salts from alkali soils (q.v.), and thus rendering them fit for the growth of useful crops. Subsoil drainage has been perhaps the most valuable improvement connected with agriculture. Consult: Storer, *Agriculture*, 7th ed. (New York, 1897); Miles, *Land Draining* (New York, 1897); King, *Irrigation and Drainage* (New York, 1899); Elliott, "Farm Drainage," in *United States Department of Agriculture, Farmers' Bulletin 40* (Washington, 1896, new ed. 1903); id., *Engineering for Land Drainage* (New York, 1903). See SWAMP; SAVANNA; BOG; ALKALI SOIL.

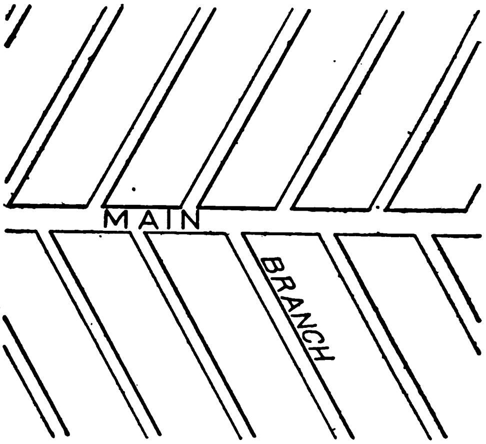


DIAGRAM OF DRAINED FIELD,
Showing angle at which branches meet the main drain.

DRAINAGE. For the use of this term in physiography, see RIVER; VALLEY; GEOLOGY.

DRAINAGE TUBES. In surgery, tubes of rubber or glass employed for removing pus or septic matter from tissues or from cavities. The rubber drainage tubes are the ones most frequently used. They are of soft rubber, from ⅛ to ½ an inch in diameter, and from a few inches to seven or eight inches in length, or even longer, and are perforated by numerous holes, from an eighth to one-quarter of an inch in diameter, throughout their length. The glass tubes are used mainly for abdominal work, and are of large diameter, usually from three-eighths to five-eighths of an inch. For special purposes tubes of metal and hard rubber have been employed. When placed in fresh wounds, or in the body cavities after operation, when suppuration is absent, their object is to remove blood, serum, or discharges which by their subsequent accumulation might become a source of septic infection. Drainage tubes were first introduced by the distinguished French surgeon Chassaignac.

DRAKE, ALEXANDER WILSON (1843—). An American artist and critic, born at Westfield, N. J. He studied oil and water-color painting, and practiced wood-engraving. From 1870 to 1881 he was the head of the art department of *Scribner's Magazine*, and afterwards became identified with the Century Publishing Company as art director.

DRAKE, CHARLES DANIEL (1811-92). An American jurist, born in Cincinnati. He served for some years in the United States Navy, then studied and practiced law in his native city, and afterwards went to Saint Louis, where he was a member of the Missouri Constitutional Convention of 1865. From 1867 to 1870 he was a member of the United States Senate, and from 1870 to 1885 was Chief Justice of the Court of Claims in Washington. He published a *Treatise on the Law of Suits by Attachment in the United States* (1854); and *Union and Anti-Slavery Speeches* (1864).

DRAKE, DANIEL (1785-1852). An American physician. He was born in Plainfield, N. J., graduated in the medical school of the University of Pennsylvania in 1815, and settled in Cincinnati, Ohio, where he became known as a physician and writer. In 1820 he organized the Medical College of Ohio in Cincinnati and secured a State appropriation for its support and that of a hospital. In 1827 he founded the *Western Journal of the Medical and Physical Sciences*, which he continued to edit until 1848. He was connected, either as a lecturer or professor, at different times, with Transylvania University, Lexington, Ky.; the University of Louisville, and Jefferson Medical College, Philadelphia. His voluminous published works on medicine include: *Topography, Climate, and Diseases of Cincinnati* (1810); *Practical Treatise on the History, Prevention, and Treatment of Epidemic Cholera* (1832); *Practical Essays on Medical Education* (1832); *Systematic Treatise on the Principal Diseases of the Interior Valley of North America* (1850-54). Consult Mansfield, *Life of Daniel Drake* (Cincinnati, 1855).

DRAKE, Sir FRANCIS (c.1540-96). An English admiral and navigator, born at Crowndale, near Tavistock, in Devonshire. He was apprenticed at an early age to a sea-captain and later engaged in the coasting trade for a few years. In 1565-66 Drake extended the field of his operations to Guinea and the Spanish Main. In 1567-68 he commanded a ship in the last expedition of Hawkins against the Spaniards, which ended so disastrously. After this he made two voyages to the West Indies, undertaken for the purpose of obtaining information preparatory to the execution of a plan of revenge for Hawkins's ill-fated squadron. This done, Drake set out on a third voyage in 1572, having with him three ships and seventy-three men, and with this force captured the Spanish town of Nombre de Dios, on the Isthmus of Panama, with an enormous store of treasure, took a Spanish galleon in the harbor of Cartagena, and burned the town of Porto Bello. Finally, the indefatigable adventurer, with eighteen Englishmen and thirty Indians, crossed the Isthmus of Panama and saw the South Sea, praying God that he "might sail once in an English ship in that sea." Laden with spoil, he sailed homeward, and reached Plymouth on Sunday, August 9, 1573. From 1573 to 1576 Drake served in Ireland; but in the latter year his thoughts turned to the sea, and in December, 1577, he sailed from Plymouth for the Spanish Main with a squadron consisting of his own ship, the *Pelican*, of 100 tons, the *Elizabeth*, of 80 tons, and three smaller vessels. That this expedition against a nominally friendly power was encouraged, if not sanctioned, by Queen Elizabeth, is undoubted. Drake sailed for South America, entered the Rio de la Plata, and went south to the straits of Magellan. After battling with the currents for sixteen days, he entered the Pacific. A furious storm separated the fleet. The *Elizabeth* returned to England, another vessel was lost with all on board, and the *Pelican*—renamed the *Golden Hind*—was alone left to explore the unknown Pacific. The voyage was a series of successful exploits. The Spanish towns on the coasts of Chile and Peru were sacked and a treasure ship was captured. Drake then steered for the northeast, hoping to find a passage back to the Atlantic, but finding his crew unwilling to encounter the cold of the high latitudes, he turned south and refitted his ships in a small harbor just north of the Golden Gate, receiving the homage of the natives in the name of Queen Elizabeth. He then steered across the Pacific, touched probably at what are the Pelew Islands and at Ternate, in the Moluccas, and after many hazardous experiences anchored off the southwest coast of Java on March 10, 1580. Thence he struck across the Indian Ocean, doubled the Cape of Good Hope on June 15, and finally arrived at Plymouth on September 26, 1580, laden with treasure and spices. Queen Elizabeth sanctioned Drake's 'reprisals,' visited the *Golden Hind*, and knighted her bold commander.

Between 1581 and 1585 Drake was Mayor of Plymouth, and during a part of the year 1585 and the whole of 1586 he commanded a fleet of twenty-one ships in a successful plundering expedition against the Spanish West Indies. From the West Indies and Florida Drake made his way up the coast to Virginia, whence he sailed for England, taking with him the disheartened Raleigh colonists whom he had found at Roanoke. It is said that he brought back to England on this voyage both the potato and the tobacco-leaf. In the spring of 1587 Drake was sent with a fleet to raid the formidable Armada which Philip was collecting for the invasion of England. He entered the harbor of Cadiz, destroyed the shipping in the roadsteads (10,000 tons), secured much booty, and withdrew to plunder the coast towns, destroying ships and fortifications as he went. From the Spanish coast he sailed for the Azores in the hope of meeting any homeward-bound ships, and was fortunate enough to secure a Portuguese East Indiaman with a precious cargo, the first intimation England had of the vast possibilities in the East India trade. He strongly urged the Queen and her Ministers to follow up the blow already given Spain without allowing it time to recuperate, and served as vice-admiral under Lord Howard in the fighting which resulted in the destruction of the Armada (q.v.). The story is told that he kept Lord Howard from putting to sea until they had finished their game of bowls, saying: "There's plenty of time to win the game and thrash the Spaniards too." The wreck of the great Armada quieted all fears of invasion in England, and by way of reprisal a fleet was sent under Drake and Sir John Norreys to the coasts of Spain and Portugal, in the spring of 1589. A large amount of booty was taken and the enemy's stores and shipping were so effectually destroyed as to prevent all possibility of a future attempt against England. A few years of quiet were followed, in 1595, by an expedition to the West Indies. The Spaniards had received intelligence of the attempt, and the Englishmen were repulsed in an attack upon Porto Rico and other places. Drake died off Porto Bello, January 28, 1596. Consult: Corbett, *Drake and the Tudor Navy* (London, 1898); id., *Sir Francis Drake,* in "English Men of Action Series" (London, 1890). The intensely interesting original narrations of Drake's exploits may be found in the Hakluyt volumes (London, 1848, 1850, and 1865); in Arber, *An English Garner,* No. V. (7th ed., Birmingham, 1880-83); and in the *Camden Miscellany,* vol. v. (London, 1863).

DRAKE, Francis Samuel (1828-85). An American author, born at Northwood, N. H., the son of Samuel Gardner Drake. His most important work is his *Dictionary of American Biography* (1872), containing 10,000 biographies, nearly all prepared by himself. He also published *Life of General Henry Knox* (1873), *The Town of Roxbury* (1878), and *Indian History for Young Folks* (1884); and contributed to Winsor's *Memorial History of Boston* (1880-82).

DRAKE, drä′ke, Friedrich Johann Heinrich (1805-82). A German sculptor, born at Pyrmont, June 23, 1805. His father was a turner, and the son also served an apprenticeship in cabinet-work. His talent in clay-modeling attracted the attention of Dr. Mundhenke, a relative of Rauch, who in 1827 obtained for him admission into the sculptor's atelier. Drake also studied in Italy, where he came under the influence of Thorwaldsen, but Rauch was his principal master, and his first works were executed under Rauch's directions. The best of them is a group representing a "Dying Warrior" (1833), crowned with the laurel of victory; a "Madonna and Child," bought by the Empress of Russia; and a graceful statue of a "Female Vine-Dresser" (National Museum, Berlin). His early works also include a series of excellent portrait statuettes of Goethe, Schiller, Rauch, the two Humboldts, and other celebrities. In 1836 he modeled the colossal bronze statue of Justus Möser, a German patriot, for Osnabrück, and in 1844 he completed the plaster statues of the eight "Provinces of Prussia" for the White Hall in the Royal Palace of Berlin. Among his best works is the marble statue of Frederick William III. in the Thiergarten, Berlin; the frieze crowning the circular pedestal, 18 feet in height, represents the enjoyment of nature, and is one of the most graceful works of modern sculpture. Noteworthy among his other works is the noble marble statue of Christian Rauch, in the vestibule of the New Museum, Berlin; another of the sculptor Schinkel (1869), and a marble group in the Schlossbrücke representing a "Warrior Crowned by Victory" (1850). Perhaps the most important of all his monumental works is the colossal bronze statue of King William of Prussia (1867), for the iron bridge of Cologne. At the Paris Exhibition (1867) this monument was adjudged the most remarkable work of modern sculpture, and brought to the sculptor the great gold medal of the Legion of Honor. His latest works include the colossal bronze statue of Alexander von Humboldt in Philadelphia and busts of Bismarck and Von Moltke. Drake is one of the foremost representatives of the German School of sculpture of the nineteenth century. His art is manly and strong, but not without a high appreciation of beauty of form. It is not a reflection of the antique, like that of Canova, but more original and modern. In his portrait work he renders the character of the subject in its most attractive features, but without false idealization. He was highly regarded by contemporaries, having been professor of the Academy of Berlin and member of the academies in Munich, Saint Petersburg, Antwerp, Rome, and of the Institute of France. He died in Berlin. Consult: Lübke, *History of Sculpture,* vol. ii. (London, 1872); Heinrich, *Rauch, Rietschel und Drake* (Basel, 1884).

DRAKE, Joseph Rodman (1795-1820). An American poet. He is chiefly remembered for his poems "The American Flag" and "The Culprit Fay," and for the eulogy by his friend Halleck (see Halleck, Fitz-Greene), beginning "Green be the turf above thee." Drake was born in New York City, was early left an orphan, and had a hard struggle in his first years. He managed, however, to study medicine, graduating in 1816, and the same year married the daughter of Henry Eckford, a ship-builder, much to the bettering of his circumstances. The same year also he wrote "The Culprit Fay," his longest work, a fanciful poem which aimed to show that American rivers were not unadapted to romance and romantic treatment. In 1818 he went to Europe, and on his return wrote a series of verse satires for the New York *Evening Post* on current events. They were done in conjunction with Halleck, and are generally known as *The Croakers.* The verses were distinctly witty and very popular. In 1819 Drake went to New Orleans to recover his health, but the following year he died of consumption in New York. *The Culprit Fay and Other Poems* (including "The American Flag") was published in 1835. There have been two later editions. The *Croaker* verses were collected in 1860.

DRAKE, Nathan (1766-1836). An English physician and author. He was born at York, and was educated at Edinburgh. After a short residence at Sudbury he removed, in 1792, to Hadleigh, Suffolk, where he became prominently known as a physician and essayist. He was a versatile and very prolific author. His more important works include: *Shakespeare and His Times* (1817), in which the accumulated material of previous editions and annotations was for the first time collated and presented in its entirety; and *On the Use of Digitalis in Consumption* (five papers published in the *Medical and Physical Journal,* London, 1799-1800). His *Literary Hours* (1798) were exceedingly popular early in the nineteenth century (4th ed. 1820).

DRAKE, Samuel Adams (1833-1905). An American editor and author, born in Boston. Upon the outbreak of the Civil War he became inspector and adjutant-general of the Kansas militia, and in 1864 brigadier-general. He wrote: *New England Legends and Folk-Lore* (1884); *The Making of the Great West* (1887); *The Making of the Ohio Valley States* (1894); *The Watch Fires of '76* (1895); *Myths and Fables of To-day* (1900); *On Plymouth Rock* (1904); *The Young Vigilantes* (1904).

DRAKE, Samuel Gardner (1798-1875). An eminent American antiquarian. He was born in Pittsfield, N. H., was educated in the common schools, and from 1818 to 1825 taught in a district school. In 1828 he went to Boston, where he established an antiquarian book-store—the first of its kind in the United States—and devoted himself to the study of early Massachusetts history. He was one of the founders (1847) of the New England Historical and Genealogical Society, was its president in 1858, and for many years was the editor of its quarterly *Register*. He published four valuable works on Indian history: *Indian Biography* (1832); *Book of the Indians* (1833); *Old Indian Chronicle* (1836); and *Indian Captivities* (1839); besides the *History and Antiquities of Boston* (1856); *Annals of Witchcraft in the United States* (1869); and *History of the French and Indian War* (1870). He also edited Church's *Entertaining History of King Philip's War* (1825); Mather's *Indian War of 1675-76* (1862); *Early History of New England* (1864); and Hubbard's *Indian Wars* (1865).

DRAKENBORCH, drä´ken-bôrk, ARNOLD (1684-1748). A Dutch classical scholar. He was born at Utrecht, Netherlands, and, after studying there and at Leyden, succeeded Burmann as professor of history and eloquence at the University of Utrecht (1716). His chief publications are an edition of Silius Italicus (1717), and his masterpiece, an edition of Livy (1738-46), which, though lacking in definite method, contains much valuable material and is still often cited.

DRAKENSBERG, drä´kens-bĕrg. A mountain range of South Africa, running through the eastern part of Cape Colony, along the eastern frontier of Orange River Colony, and forming part of the northwest frontier of Natal (Map: Orange River Colony, N 6). It may be regarded as a link of the great mountain system which traverses the greater portion of Cape Colony and a direct continuation northward of the Stormbergen. The highest peaks are Mont-aux-Sources, Champagne Castle—both estimated altitudes of 10,500 to 12,000 feet—and Giants' Castle (9600 feet). Its two passes of Van Reenan (5400 feet) and Laing's Nek (4100 feet) are crossed by railways. This region was the scene of numerous battles between the Boers and the British.

DRAKE UNIVERSITY. A non-sectarian, coeducational institution in Des Moines, Iowa. It was founded in 1881, largely through the beneficence of Francis M. Drake (whose name it bears) and D. R. Lucas, and is under the control of the Church of Christ. The management of the university is vested in a board of trustees which will in the course of time number twenty-five members. The departments represented are those of liberal arts, law, medicine, Bible, dentistry, and music; there are also summer schools, a commercial school, and various training schools operated in connection with the university. The degrees conferred by the college and graduate schools include: B.A., B.Ph., B.S., B.D., M.A., M.S., LL.B., M.D., B.Pe., and D.D.S. In 1906 the institution had 109 instructors and 1634 students. The library contains about 10,000 volumes. The presidents of the university and their terms of service have been as follows: George T. Carpenter (1881-93), Barton O. Aylesworth (1893-97), William B. Craig (1897-1902), and Hill M. Bell (1902—).

DRAMA (Lat., from Gk. *δρᾶμα*, from *δρᾶν* *dran*, to act). A form of literary art designed for the direct representation of human actions and characters, through their impersonation by actors before an audience. Though many modern plays have been written in prose, the drama is historically classified as a department of poetry, side by side with the epic and the lyric. The former of these describes events in the narrative form; the latter is the detached expression of individual emotion. Both of these elements may enter into the drama in a subordinate way, but in dramatic poetry the facts of a story are actually developed upon the stage in the interchange of speech and action. It is the action, too, which distinguishes the drama from simple dialogue, in which the persons are mere mouthpieces for the expression of ideas. The drama brings into play every emotion which can be objectively expressed, whether by word or gesture or play of feature, or what the modern playwright describes as 'business.' The illusion of reality is heightened by the efforts of the scene-painter and the stage-manager, which, however, belong to the technical side of dramatic art. See THEATRE.

The division of a play into acts and scenes, however (see ACT), is a usage originating in the subject matter of the drama itself, though the invention of the drop-curtain and scene-shifting accessories make it seem to some extent an affair of mechanical adaptation. The several acts mark different stages in the development of the theme, successively introducing the characters and elements of the plot, showing the complications which led to its climax, and finally solving its problem by the 'catastrophe.' The natural changes of background commonly coincide with the changes of acts. The succession of scenes (subdivisions of acts) usually depends, in a classical play, upon the entrance or exit of important characters.

The same double consideration underlies the famous doctrine of the 'unities,' which are in part a formulation of the inevitable restrictions of the stage. They are traced to some of Aristotle's remarks on tragedy, in his *Poetics*, but they were most definitely accepted as conventions of the theatre by the classical French dramatists, Racine and his successors. The 'dramatic unities' are three: of place, of time, and of action. The first precludes any extensive change of scene. The second requires that all the events of the play must occur within the space of one day. Unity of action demands that all the incidents of the play shall converge upon the development of a single plot. Of these three rules, modern criticism, with Lessing and the French romanticists, and according to Shakespeare's practice, is generally agreed in regarding the last as the only one which is fundamental; the others are due primarily to accidental conditions which no longer prevail. Upon the Greek stage, the model for the classicists, since there was no curtain and very little possibility for change of scene, unity of place was practically inevitable, though even this was not maintained without exception. Unity of time was rendered almost equally necessary by the habitual presence of the chorus throughout the play, which would be an evident absurdity if the plot were carried across long intervals of time; the same would generally be true if the same chorus were to appear successively in different places. What is called unity of action, however, is simply an application of the principle which demands unity of impression in the work of any art. Only when subordinate to this last 'unity' do those of time and place demand consideration upon the modern stage; though it is undoubtedly true that realism of impression is aided if the imagination is not taxed with wide gaps in either time or place.

The question of unity is often practically involved in the creation of a double plot, the secondary or under plot being concerned with the interests of subsidiary characters in the play. This, by way of contrast and relief, may really serve the effectiveness of the main action.

The classic departments of the drama are tragedy and comedy, terms which have come down to us from the Greeks. The essential distinction has been said to lie in the fact that a tragedy has a sad ending, while comedy ends happily; but this is far from expressing all the difference. Tragedy deals in a serious way with serious themes, especially the deeper sufferings of humanity. Comedy exploits the follies and absurdities of the ridiculous and the base. While all drama is intended to entertain, tragedy does it through the excitement of sympathy, comedy through the excitement of mirth. A satirical purpose, however, may dictate the choice of the object of ridicule. The under-plot, also, in a tragedy, often introduces a comic element by way of counterpoise to the tragic emotions excited by the principal plot, and of contrast to heighten the impressiveness of the latter; this is one, for instance, of the effects in the grave-digging scene in *Hamlet*. Diversity of plot, however, is much more to be found in modern than in ancient plays. Many species of drama, too, do not fall into the regular categories of either tragedy or comedy. The so-called historical and romantic dramas are sufficiently defined by their names; the *melodrama*, in Italy a form of opera, has become a species of mixed tragedy and comedy, broadly treated and appealing to the less critical emotions; in France has been defined the sort of play which is named specifically *le drame*, described variously as *tragédie bourgeoise* or *comédie larmoyante*, and representing life with little limitation as to form. (On the musical drama, see OPERA.) Comedy has developed several special varieties, from the 'comedy of manners' of the eighteenth century to farce and burlesque and vaudeville (qq.v.); the pantomime and ballet (qq.v.) are relatively ancient offshoots from the regular drama, if they do not in some cases form part of its origin.

Mimicry, which is fundamental to the acted drama, is of course a part of human nature, and is doubtless to be found among all peoples. In many forms of literature, too, the dramatic tendency appears. Thus the Old Testament contains dramatic dialogue, as in the Book of Job, and dramatic lyrics, as in the Canticles; they are to be distinguished, however, from developed drama. Regular dramatic history begins in Greece.

GREEK DRAMA, both tragedy and comedy, developed in connection with the worship of Dionysus. (See BACCHUS.) In the Dionysiac festivals of Attica, the satyr followers of the wine-god were impersonated by choruses of men half-clad in goat-skins—whence probably we have the word tragedy (*τράγος* a goat, and *τραγῳδία* goat-song) —chanting dithyrambic songs of the life of the god, as they danced about the altar. Thus, about B.C. 600, the poet Arion, at Corinth, led his cyclic chorus of fifty. A half-century later came Thespis, of Attica, whose Thespian innovation was the introduction of an actor to fill the intervals of singing with stories and mimicry and short dialogues with the leader of the chorus. In time the more serious performances came to be limited to the sadder parts of the Dionysus story and of other tales in the familiar mythology. When Pisistratus established at Athens the winter festival of the *Lenæa*, as at the *Great Dionysia* somewhat later, prize dramatic contests were included in honor of the god, and the development of tragedy was continued by Chœrilus, Phrynichus, and other playwrights. It is to the great tragic writers of the fifth century B.C., however, that the Athenian stage owes its fame. Æschylus enlarged the possibilities of the drama by increasing the number of actors to two. Sophocles added a third. The original dithyrambic chorus of fifty men had been divided into four of twelve each (later increased to fifteen by Sophocles), with the custom of presenting plays in groups of four, called tetralogies. In one play of each tetralogy, the original satyric form was maintained. The other three, the trilogy, properly formed a consecutive series upon a single legend. A tragedy, in general, was made up of a series of 'episodes,' separated by lyric passages sung by the chorus, the whole introduced by the prologue and terminated by the 'exode.' During the festival, play after play was given the whole day through. The actors were trained by the author himself, so that to 'teach' a drama, or a chorus, became the regular phrase for bringing out a play. The expenses of the production, however, were borne by a chosen citizen known as the *choregus*, who thus participated in the contest. On the external form of dramatic representation in the great theatre of Dionysus, the masks, costumes, etc., see THEATRE.

The Athenian tragedy was not a mere entertainment, but a serious religious function. Its motive, as defined by Aristotle in his *Poetics*, was to purify the passions of fear and pity through the exalted exercise of them. Characterizations of the 'great tragic trio' of Athens have been innumerable, from the time of Aristophanes down. In the dramas of Æschylus, the idea of *Nemesis*, divine vengeance, which lies at the heart of Greek tragedy, is an overwhelming mystery. In Sophocles it is visibly a part of the moral law of life, while in Euripides it becomes more simply a source of human sadness. The difference in the attitudes of these three great poets, who were so nearly contemporaneous, is typical of the whole progress of Greek tragedy. Beginning as a popular religious festival, it became a vehicle of expression for some of the deepest solemnities of Greek religious thought, and then gradually was secularized and lost its vitality. Ion, Achæus, Agathon, and other writers who succeeded the great period, are of confessed inferiority, and none of their works have come down to us. With the dropping of the chorus, much of the lyrical element was lost. From being an Athenian institution, tragedy spread to other Greek towns, and from the Dionysiac festivals it was extended to others, till its special relation to the worship of Dionysus disappeared. The earlier works were continually reproduced, however, and at Alexandria, under the Ptolemies, tragedy shared in the general revival of literature and the arts.

The development of Greek comedy was parallel with that of tragedy. The name is derived from *κῶμος*, a band of revelers, or from *κώμη*, a village, with *ᾠδή*, a song. The rude jests with which the songs of the more rustic Dionysus festivals were enlivened led naturally to a dramatic composition of the same character. Susarion of Megara is said to have introduced comedy into Attica early in the sixth century B.C., but before it was encouraged at Athens it came to a considerable development elsewhere, particularly among the Dorians of Sicily, where flourished Epicharmus and Sophron, the inventor of mimes. The history of Athenian comedy is familiarly divided into the three periods of the Old, Middle, and New Comedy. The best-known writers of the first were Cratinus, Crates, Eupolis, and Aristophanes, who is its great exemplar. Organized in a manner similar to tragedy, but with a chorus of twenty-four and an additional element called the *parabasis*, in which the audience was directly addressed, it dealt frankly in personalities, was largely political, and did not hesitate to caricature the leading men of the day. Middle Comedy marks the beginning of a period when freedom of speech was less unlimited, and when the follies and foibles of whole classes rather than of individuals furnished the butt of the comedian's ridicule. The chorus lost its connection with the drama and was dropped. In the so-called New Comedy of Menander and Philemon, at the beginning of the third century B.C., the tendency seems to have been brought to its logical development. Instead of to political questions of the day, the comic writer devoted himself to the exhibition of ridiculous complications of social life, in a society which with its simplicity had lost much of its virtue. Types were developed which are still familiar upon the stage, such as the gullible old man, the dissipated son, and the tricky and impudent servant, who may be called a sort of male prototype of the soubrette. This later Greek comedy is chiefly known to us through the adaptations of the Roman comedians Plautus and Terence.

ROMAN DRAMA. Comedy appears to have been the sort of poetry most natural to the Romans, who had not on the whole great dramatic gifts. Comic elements existed in the *saturæ* of the early Latin towns. Yet the Romans borrowed, according to the common account, their first idea of a play, during a period of national despondency (B.C. 364, Livy, vii. 2), from the Etruscans, from whom came their word *histrio*, an actor (whence our 'histrionic'); the effusions of sportive humor in the rude farces known as *fabulæ Atellanæ*, came to them from the Oscans; those called mimes they took from Magna Græcia; their literary drama was almost wholly an imitation of the Greek. The drama was one of the earliest branches of literature to be cultivated at Rome. There were both comedies and tragedies by Livius Andronicus, Nævius, and Ennius, and tragedies by Pacuvius and Attius, besides others less known, all patterned after Greek originals, but practically none of these works have come down to us. Nævius is celebrated for having got into trouble by ridiculing prominent people in imitation, it is said, of the Old Comedy at Athens. Practically all we have of Roman comedy belongs to the works of Plautus and Terence, of the class called *palliatæ*, closely adhering to their Greek models in scene and subject, in distinction from the so-called *togatæ*, which had Roman subjects. Plautus was once a poor day-laborer; Terence a Carthaginian slave; and the style of each is characteristic. Plautus has a degree of rough vigor and broad jocularity, while Terence is more refined and delicate in his wit and characterization. Both these writers based their work upon the New Comedy of the school of Menander and Philemon. One change of form is to be noted in particular: the prologue ceased to be the first act of the play, and became the species of detached explanation which it has since remained.

Tragedy, more as literature than for acting upon the stage, continued to be cultivated by many of the writers of the Augustan Age and later, with the expressed ambition of rivaling the Greeks. Of all these attempts, however, we have only the ten rhetorical dramas which are credited to the philosopher Seneca, though they are certainly not all his. One of them, the *Octavia*, is of the class called *prœtextæ*, with Roman historical subjects; the others are all from Greek mythology. With the general decline of popular taste under the Empire, all 'legitimate' drama fell into decline, and the stage was held by dancers and pantomimes, some of whom became immensely popular favorites. The most celebrated of Roman actors is Roscius, to whose excellence Cicero testifies.

INDIAN DRAMA. Another national drama which has been said to be derived from that of the Greeks is that of India; this, however, is a disputed point, and Indian drama is now generally thought to be of independent growth. Like the Greek, it arose in a religious connection, along with the dances and songs of the popular festivals. The Hindu drama, however, has no tragedy and makes far more of the motive of romantic love than does that of the Greeks. Kalidasa, one of the earliest names in its history, as well as the greatest, has been commonly assigned to the first century B.C., but recent criticism places him several centuries later. The best period of Sanskrit drama, then, was from about the fourth to the ninth century A.D. A peculiar feature of the Indian plays, though not without some Greek parallel, is the use of different dialects for different characters. Gods and heroes and men of high position speak Sanskrit; women and men of low rank speak various forms of Prakrit.

The best-known Sanskrit play is the *Sakuntala* of Kalidasa. It was translated by Sir William Jones in 1789, and is an heroic love drama of great beauty. Kalidasa is also the author of a five-act play, called *Vikramorvaśi* (The Hero and the Nymph). Next in importance among Hindu dramatists was Bhavabhuti, a Brahman of Southern India in the eighth century; two of his three plays concern the adventures of Rama, the hero of the epic *Ramayana*, on which, indeed, are founded several of the later Indian dramas. Two other noted plays are the *Mṛicchakaṭika* (The Toy Cart), a drama of social life, in ten acts, credited to a king named Sudraka, of the sixth century, and *Ratnavali* (The Pearl Necklace), a romantic piece supposed to have been written by King Sriharsha, of the seventh century. With the coming of the Mohammedans, the drama in India gradually declined, and, though Sanskrit plays have been written in modern days, they are rarely acted.

CHINESE DRAMA. The only other Oriental branch of the drama that requires mention is the Chinese, which, in spite of the antiquity of other Chinese literature, is comparatively modern. There are reasons for thinking it to have been derived from the Tatars, though it has commonly been considered an evolution from the native songs and dances. In the eighth century A.D. a sort of academy of music, known as the 'Pear Garden,' was founded by an emperor of the T'ang Dynasty. Drama proper did not develop till about the thirteenth century. Its best period is considered that of the Yuen Dynasty, ending in the fourteenth century; but perhaps the most famous of all Chinese plays is the one called *Pi Pa Chi* (Story of the Guitar), of a somewhat later period. There are many printed collections of plays, but these differ materially from their acted versions. The avowed aims of the Chinese drama are of the most elevated sort, glorifying all the virtues. The pieces themselves are generally rather arid and conventional; as acted, they include much interpolated matter, such as to give reason, perhaps, for the low esteem in which actors are held. Chinese plays are broadly classified, not as tragedies and comedies, but as 'civil' or 'military.' The latter include combats and violent deeds of all sorts. The former are quieter and deal with the more ordinary aspects of social life, with a tendency to the comic. There is little attempt at realism or stage setting. Women's parts are taken by men. Whole series of pieces are commonly performed without intermission, a fact which has led to statements as to the extraordinary length of Chinese plays.

The only drama of importance developed among the native civilizations of America was the so-called Inca drama of Peru.

MEDIÆVAL DRAMA. Europe during the Middle Ages saw dramatic progress in one direction. Many of the Christian Fathers condemned dramatic exhibitions of all kinds, but the Church as a whole, more practical, undertook to offset the pagan shows by a Christianized equivalent. This seems to have arisen naturally, out of the responsive chants and narrations of biblical events with which the congregations were both instructed and entertained, and which in time came to be a regular liturgical drama, developing into the *miracle-plays* (q.v.), and *mysteries* (q.v.), and *passion-plays* (q.v.) which at Oberammergau and elsewhere have come down to our own day. With a similar purpose arose also the *moralities* (q.v.), which were often rendered by wandering churchmen. Out of such beginnings, varied somewhat by occasional secular tendencies (see FARCE), modern drama may be said to have promised to develop, when the Renaissance came with a new impulse.

ITALIAN DRAMA. In Italy, where the revival of the classical type was earliest, the religious drama reached a considerable degree of literary progress before it was superseded. The fifteenth century saw the development of the so-called *Rappresentazione Sacra*, produced chiefly in connection with the festivities in honor of Saint John the Baptist. Notable among these are the *Abramo e Isacco* (1449) of Feo Belcari, and Lorenzo de' Medici's *San Giovanni* and *San Paolo*.

The modern history of the drama in Italy, passing by less regular attempts like that of Poliziano, is considered to begin with Trissino's *Sofonisba* (1515), a dull and conventional tragedy in blank verse. About the same time Plautean comedy was revived in the writings of Cardinal Bibbiena, Ariosto, and Machiavelli. Tasso's *Aminta* (1573) set a fashion of pastoral drama which was much imitated. Toward the end of the century, Giambattista della Porta, playwright as well as philosopher, exhibited a number of comedies of a familiar and sometimes even farcical kind, but of an agreeable originality. The political influence of Spain was now at its height on Italian territory, and the romantic drama of the West gradually found favor in Italy. Borghini, Michelangelo Buonarroti, nephew of the great artist, and other writers continued the reaction against the domination of the classic taste; notable in the movement were Buonarroti's comedies, *Tancia* (1612) and *Fiera* (1618). About the beginning of the seventeenth century, too, Rinuccini and others, by the union of music with the romantic drama, succeeded in establishing what was called *melodrama.* Regular tragedy and comedy were wellnigh superseded, and all Italy turned to the *musica opera.* Zeno, a century later, fixed the musical drama on a literary level, and in it Metastasio, whose popularity was established by the performance in Rome (1723) of his *Didone Abbandonata*, completely fascinated the Italian public. His long series of works culminated in the triumph of his *Atilio Regolo* (1750).

Meanwhile, however, the regular drama had been revived. The archæologist Maffei composed his *Merope* (1713), with the definite purpose of restoring the classic tragedy to Italy. The political preponderance of Spain had now given way to that of France, and Maffei's friend, the actor-playwright Riccoboni, contributed not a little to the consequent increase of French influence upon the Italian stage. The other foremost names of the eighteenth century in Italian drama are those of Goldoni, Gozzi, and Alfieri. Goldoni, who left his native Venice in 1761 to complete his life in Paris, has been called 'the Italian Molière'; he is the great Italian exemplar of regular literary comedy. His great rival, Carlo Gozzi, won fame in quite a different style. Taking the popular institution of the *commedia dell' arte* ('comedy of masks'), for which Goldoni expressed contempt, he gave it a literary form which for a few years enjoyed immense success. The bold and passionate Alfieri inaugurated a new era in Italian tragedy. He was a follower of the classic school, an observer of the unities, and aimed, while writing such tragedies as *Filippo II.*, *Saul*, and *La Congiura de' Pazzi*, to help revive the vigor of the national spirit. His successors, among them Monti, Niccolini, Manzoni, Silvio Pellico, and, later, Cossa, somewhat relaxed their adherence to classic forms; in the nineteenth century Italy shared in the extending influence of Shakespearean methods. The dramatists thus affected have given prominence to historical drama, and some of their works have been of a high order. In recent years the novelist and poet D'Annunzio has gained some distinction as a playwright, with dramas written for the actress Duse. Among the other Italian actors of the past century who have gained an international reputation are Modena, Tommaso Salvini, and Madame Ristori.

SPANISH DRAMA. The great period of the Spanish drama came earlier than did that of Italy, and at a time when the best poets, while writing for the stage, still busied their pens in the composition of religious dramas in the service of the Church. Passing over some of the earlier names, among them those of Santillana, Lope de Rueda, who, as actor, manager, and playwright, has been called the Patriarch of the

Spanish Stage, and his follower Naharro, we come to the century of Cervantes, Lope de Vega, and Calderon. The genius of Cervantes was more decidedly epic than dramatic. Yet in *La Numancia* he has left a serious tragedy of permanent worth and dignity. Contemporary with him were the lesser writers Cueva, Virués, and Argensola. While the critics, however, were clamoring about the classic rules of the drama, Lope de Vega appeared upon the scene, to set nearly all the laws at defiance. He was a writer of the most prodigious facility, as well as dramatic vigor. More than eighteen hundred plays are said to have been his work, and he won immense popularity, to which, indeed, he sacrificed some of the more enduring qualities. Of the same period were Ruiz de Alarcón and Tirso de Molina (Gabriel Tellez), whose *Burlador de Sevilla, ó el convidado de piedra* is a play notable for having introduced the famous character of Don Juan. Calderon, who succeeded to the greatness of Lope de Vega, had the additional merit of serious devotion to dramatic art. The lyric element is prominent in his plays, and they include many of the highest expressions of Spanish ideals, of devotion to the King, to the Church, and to personal 'honor.' Famous among his creations were the religious plays called *autos sacramentales*, in which the mystery of the Eucharist was dramatically set forth. With his death in 1681, the brilliant period of the Spanish theatre was nearly closed. His contemporary Moreto wrote numerous fine comedies, notably the 'cloak and sword plays,' for which the Spanish stage is proverbial; and the name of the historian Solis is worthy of mention. For the theatre of the present day in Spain, Echegaray is the best-known writer.

French Drama. France, in the revival of the classical drama, accepted the 'unities' as the first essentials in the drama. This was in great part owing to the logical temper of the national genius. Previous to Jodelle, or, indeed, to Corneille, hardly any progress had been made in regular dramatic composition. A number of writers had produced *mystères*, *moralités*, *sotties*, *farces*, in which in numerous instances the romantic or anti-classical tendencies of human nature had manifested themselves; but neither in the representations of the *Confrères de la Passion* nor more secular performances like those of the *Enfants sans Soucy* was there any great advance in proper dramatic achievement. Jodelle, at the Court of Henri II., was the first to exhibit a regular five-act tragedy. He composed other pieces of some merit, but nothing of any great importance to the drama was done in the half-century that succeeded. Corneille appeared in the reign of Louis XIII. during the time that the star of Richelieu was in the ascendent; he had to humor the Court by humoring the Academy, and to please the Academy he was required to observe the rules of Aristotle. He had produced several plays of a severe elegance and dignity of style, when inspiration came to his more romantic tendencies in the Spanish story of the *Cid*. All Paris rang with the praises of his 'tragi-comedy,' but the Academy held aloof, till the matter became an historic controversy, and Corneille had to betake himself again to the classic limitations. He got what he longed for, however, a seat among the members of that institution which had helped repress the spontaneous outflow of his genius. It was more than came to his contemporary, the great comedian Molière, who insisted to the last upon playing his part as well as penning his pieces, an abuse which the dignified academicians could by no means tolerate. Yet it may be questioned whether in all the essentials of pure comedy Molière's is not the very foremost name in the history of the stage. He, like Shakespeare, borrowed much from the Italians, and much also from the Spaniards and the Latins, but made his theatre the true expression of the French genius for witty characterization. Comedy, besides, more than tragedy, maintained a relation with the spontaneous forms of the drama which preceded the Renaissance. The favorite tragic poet of the Court of Louis XIV. was Racine. His powers lay decidedly in the region of the serious and the exalted, so that he had no temptation, like Corneille, to pass the bounds of the academic proprieties. In tenderness and elegance all French writers yield to him; in his *Athalie*, his last and best drama, interpreted by the actors Baron and Madame Champmeslé, he gave to the Parisian public a composition such as in breadth, elegance, and severe grandeur it could nowhere find apart from the Greek theatre. Passing by Boursault and the other lesser writers who saw the decline of Racine and Molière, and such artists on the stage as Adrienne Lecouvreur, Lekain, and Mlle. Clairon, we come to the brilliant and erratic Voltaire. He astonished Europe with the force and power of his romantic tragedies, in a style of composition which, since the *Cid*, had been excluded from the theatre. The intolerant iconoclasm of his warfare with superstition was perhaps too distinctly revealed in his dramas, but his genius and spirit have earned for him a place beside the great tragic names of Corneille and Racine. Among the writers of the period that followed were Lemercier and Chénier, whose tragedy of *Charles IX.*, played by Talma, led to the division of the Comédie Française, while among the other famous actors at the national theatre were Mlle. Dumesnil, Monvel, and his daughter, Mlle. Mars.

In the nineteenth century, the drama of France has been more productive than that of any other nation. Notable among the writers of the century are Alfred de Vigny, Scribe, and Legouvé, who collaborated in a large number of successful pieces, Dumas père, and Victor Hugo —leaders of the 'romantic movement,' the battle over which converged about Hugo's *Hernani* in 1830—Alfred de Musset, Emile Augier, Dumas fils, Victorien Sardou, and more recently Edmond Rostand, who has very successfully revived the poetical play. No sketch of the French drama can overlook the services of an institution like the Comédie Française (q.v.) in maintaining the literary qualities of the stage and encouraging its support by the leading writers of the nation, while artists like Mlle. Rachel, Sarah Bernhardt, and Constant Coquelin have often been better known than the authors whose lines they spoke.

German Drama. The German drama is almost wholly dependent for its fame upon the names of Lessing, Goethe, and Schiller. For while Hans Sachs, Ayrer, and some others showed ability and some fertility, and while Gryphius, Gottsched, Gellert, and Schlegel made advances in the appreciation of the laws of dramatic composition, yet through the end of the seventeenth and the beginning of the eighteenth centuries the German theatre was little more than a feeble reflex of French influence. Lessing, however, taught Germany to appreciate the productions of the romantic drama, both by his creations and by his criticisms. His *Miss Sara Sampson*, his comedy *Minna von Barnhelm*, and his later tragedies opened a new era for the German drama, while in his *Hamburgische Dramaturgie* he attacked French classicism, praised Shakespeare, and professed his adherence to the principles of Aristotle. Goethe, his great successor, is without doubt one of the world's foremost geniuses; yet it is debatable whether his rank among writers for the stage is quite so high. His *Faust* must always retain its place as one of the greatest of modern compositions; but his chief purpose was complete self-cultivation, and in the prologue to this, his last, and by far his most famous production, he sets forth why, although writing in the dramatic form, he could not altogether accommodate himself to the demands of a popular theatre. Schiller was more expressly the dramatic poet of Germany than Goethe. While Goethe's genius was fuller and more complete, Schiller made up for what he wanted in breadth of vision by the practical intensity of his powers. From his wild play of *Die Räuber* down to his last drama of *Wilhelm Tell*, he worked with a vehemence that made an enduring impression upon the national theatre. His contemporary Iffland, actor and manager as well as dramatist, should not be left unmentioned; nor such actors as the Devrients, Schröder, Dawison, Friedrich Haase, and others who have maintained the traditions of the drama before the public. Leading German dramatists of today are Sudermann, who is counted a member of the naturalistic school, a writer of problem plays in which, however, theatrical effect is no less carefully studied; Hauptmann, in whom the evidences of symbolistic tendencies are more apparent; and, among the younger men, Halbe and Hartleben.

DUTCH, SCANDINAVIAN, AND BELGIAN DRAMA. Among the Dutch, the drama has had but slight independent growth. In the sixteenth and seventeenth centuries, van den Vondel and others participated in the dramatic revival that followed the Renaissance; but the later Dutch stage largely imitated that of France. The Scandinavian countries have more recently developed a drama of importance. In the first half of the nineteenth century, Oehlenschläger, in Denmark, with his use of the heroic figures of the northern mythology, belongs among the followers of the romantic school. The Norwegians Björnson and Ibsen, following later tendencies, have become very distinctive figures in the drama of psychological and social problems, the work of Ibsen especially having become a battle-ground of the critics. In Belgium, which has been counted, from an artistic point of view, as a province of France, the most noted work of recent years has been that of the poet Maeterlinck, whose plays have served as an extreme type of some of the features of the Symbolist movement.

RUSSIAN DRAMA is also of late development. Though there had been Russian religious plays of an earlier day, the first Russian theatre in Saint Petersburg was established in 1756, and there its director, Sumarokoff, and Kniaznin and others of the time wrote pieces in the French style. Catharine II. herself wrote satirical comedies, and Ozieroff is a writer of tragedies of some reputation. To the nineteenth century belong Griboyedoff, the author of *Gore ot Uama* ("The Misfortune of Being too Clever"); Gogol, whose comedy *Revizor* ("The Inspector") made a great sensation; Pushkin, whose *Boris Godunoff* shows the change from French to Shakespearean influence; and Ostrovski, a writer of numerous comedies.

ENGLISH DRAMA. In England, as elsewhere, the early dramatic exhibitions were connected with the Church. Ecclesiastics were at first not only the authors but the actors of the miracle-plays and mysteries by which religious instruction was combined with a good deal of grotesque amusement. The moralities, in which abstract qualities were personified, marked an imaginative advance, and it has been questioned whether the regular comedy was not to some extent an evolution from them, through the gradual substitution of real and strongly characterized persons for mere abstractions. It was about the middle of the sixteenth century, however, when the influence of the Renaissance had been felt, that the drama extricated itself from these ancient fetters. The earliest known English comedy (before 1551) is *Ralph Roister Doister*, written by Nicholas Udall, a learned master of Eton. A few years afterwards appeared the first tragedy, called *Gorboduc, or Ferrex and Porrex*, a dull and declamatory production in blank verse by Sackville and Norton. From this time dramatic production was rapid, though at first without great improvement. To pass by the names of Bishop Still and of Kyd, Lodge, Lyly, Peele, Green, and Nash, mention is due to Christopher Marlowe as the greatest of Shakespeare's predecessors. He is the author who first introduced upon the public stage blank verse, the vehicle of English drama, and there are passages in his tragedies of *Doctor Faustus* and *Edward II.* which are accounted not unworthy of Shakespeare himself.

But all these earlier playwrights are obscured by their nearness to the great luminary of the English drama. Shakespeare is almost universally acknowledged to have been the greatest dramatic genius that has appeared in the world. Disregarding or ignorant of the 'unities,' and writing for a stage as yet unaided by any but the slightest scenic accessories, he brought the romantic drama to its highest perfection. His writings present the finest example of the depth, sublimity, refinement, and variety of which the drama is capable: and they are abundantly marked by those peculiar characteristics which sprang from the union in their author of such wonderful powers of conception with such familiar experience of theatrical management. (For a more detailed discussion of his plays, see the special article SHAKESPEARE.) Of the other actors of Shakespeare's time we know less; but Burbage and Alleyn are among those whose names have come down to us. Among dramatists, the best of Shakespeare's contemporaries were Ben Jonson, Beaumont, and Fletcher. Like Shakespeare, Jonson wrote both comedies and tragedies; but he showed more of the influence of the classic models. Milton speaks of 'Jonson's learned sock,' and thus in a phrase hits off the main feature of his character as a dramatist. Yet he was famous in the composition of such light and graceful pieces as the masques in which the Court found entertainment. (See MASQUE.) Beaumont and Fletcher, who were joint workers, have the honor of standing next to Shakespeare in the romantic drama of England; but, like Lope de Vega, they wrote too much for the success of the moment to be ranked in the foremost file of England's dramatic writers. With Dekker, Massinger, Ford, Webster, Chapman, and Shirley, the older English drama is closed, sharply terminated by the Puritan Revolution.

With the Restoration came a drama representing much more the social life of the Court, and in its form largely reflecting French influence. Under the direction of such managers as Davenant and Killigrew, plays were much more elaborately staged than before, and the drama was very much better patronized. On the stage were Betterton and Mrs. Barry. The chief literary figure of the time was Dryden, who wrote successfully both tragedy and comedy. The tragedies of Lee and the unfortunate Otway, with such comedies as those of Shadwell and Wycherley, bring down the drama to Vanbrugh, Congreve, and Farquhar, writers whose brilliant depiction of the externals of society is clouded by an immorality and an indecency even more marked than that of some of Shakespeare's immediate successors. Gay and Mrs. Centlivre, and the actor-playwright Colley Cibber, displayed in their comedies considerable dramatic spirit and invention. Of quite another sort was Addison's tragedy of *Cato,* famous in the annals of literature and successful on the stage for the old-fashioned political virtues which it solemnly set forth. Lillo, Moore, Garrick the actor, Goldsmith, the Colmans, and Cumberland nearly all took to prose instead of verse. They produced agreeable comedies; but, except Goldsmith's *She Stoops to Conquer* and one or two other pieces, nothing very important appears in the history of the drama till the time of Sheridan, who gave an impulse to 'genteel' comedy such as has placed him ever since at the head of the writers of that species of composition. Famous among the favorites of the stage meanwhile had been 'Peg' Woffington and Katharine Clive.

Sheridan's immediate successors, Holcroft, 'Monk' Lewis, Maturin, Mrs. Inchbald, and others, have left little that is remembered; but such interpreters of the drama as John Kemble, Mrs. Siddons, and later Edmund Kean, save the period from unimportance in dramatic history. Joanna Baillie, the poets Byron and Coleridge, and Henry Tayler wrote fine meditative dramas, little suited, however, for actual presentation upon the stage; and the same may be said of much of the more recent dramatic poetry of Tennyson, Browning, and Swinburne. The list of writers for the English theatre in the nineteenth century is long. Among the earlier ones, Sheridan Knowles and Bulwer-Lytton wrote plays which are still known on the boards. Later came Talfourd, Jerrold, Shirley Brooks, Tom Taylor—who wrote over a hundred pieces, many of them very popular—Marston, Wills, Charles Reade—who, with Boucicault or alone, dramatized several of his own works—T. W. Robertson, H. J. Byron, Sydney Grundy, W. S. Gilbert—who is best known, however, for the comic operas in which he collaborated with Arthur Sullivan—H. A. Jones, A. W. Pinero, Haddon Chambers, J. M. Barrie, H. V. Esmond, and Stephen Phillips. Not to be neglected also in our account is the important influence of such actor-managers as Macready, Buckstone, the Bancrofts, Sir Henry Irving (to whose company belongs Ellen Terry), and Sir Charles Wyndham, in giving direction to dramatic production.

AMERICAN DRAMA. The American stage was naturally in its origin a mere dependent upon that of England; and the sameness of language, the similarity of dramatic themes, and the constant interchange of English and American actors still make it difficult to separate the drama of the United States from that of Great Britain. At the present day American successes are reproduced in England hardly less than successful English plays on this side. Independent dramatic production in this country, however, as an infant industry labored under one particular disadvantage, owing to the absence till 1891 of an international copyright. A manager could always adapt, translate, or reproduce outright, at no expense and litle risk, a play that had met success abroad; whereas, to purchase one from a native writer involved at the outset a definite outlay and the subsequent risk of failure. Partly in consequence of this, dramatic history in America has had to do more with players than with playwrights. Yet the literature of the drama in the United States is extensive, though, as in England, much of it is of little value. Not a little of that belonging to the years which followed the Revolutionary War consisted of trashy pieces for the exploitation of crude patriotism, setting forth the yet unseasoned glories of our military achievements. It had been only a few years before the Revolution that the first permanent playhouse was built—the Southwark Theatre in Philadelphia (1766)—followed the next year by the opening of the John Street Theatre in New York. Here in 1787 was presented what is considered the first play by an American author regularly produced upon the stage—*The Contrast,* written by Royall Tyler, afterwards Chief Justice of Vermont. It has been asserted, however, that Godfrey's *Prince of Parthia* was acted in Philadelphia some twenty years before. The dramatic qualities of *The Contrast* were of the slightest, but it served to introduce to the boards the personage known as the exaggerated 'Yankee,' who could not be banished for three-quarters of a century. The first prolific American dramatist was William Dunlap, some of whose work was fair for the period. He produced about fifty plays, a few of them translated from the German. The opening of the Park Theatre, New York (1798), gave a new impulse to the drama, although the chief players were from the old country and the opening play was *As You Like It.* Here, in 1809, 'the American Roscius' made his début as Young Norval. This lad was John Howard Payne. He not only appeared with great success in this country and in England, but he wrote and translated a number of plays, of which his own *Brutus, or the Fall of Tarquin,* still keeps the stage. It is a well-constructed tragedy, and is the first drama of importance written by an American author.

It was not until about 1820 that literary and cultured people began to look with favor upon the drama. In that year the great tragedian

Edmund Kean visited this country and played in New York and Philadelphia. Ten years later came his son Charles. The great and erratic Junius Brutus Booth first appeared in the United States in 1821; he came again in 1833. Macready made his first visit in 1826. Clara Fisher came in 1827. The season of 1832-33 brought over Charles and Fanny Kemble, who enjoyed an immense popularity. Meanwhile the elder Kean was hardly gone after his second visit when Edwin Forrest appeared in New York in the Shakespearean part of Othello (1826). Forrest is held in memory by many as the greatest of American tragedians. While doubtless at his best in Shakespearean tragedy, he was always intensely American in feeling, and undertook to infuse the native idea into his work. John A. Stone's *Metamora* was written for him, as was also R. N. Bird's tragedy of *The Gladiator*. One of the most popular of Forrest's contemporaries was the comedian James H. Hackett, who became famous as Falstaff and in 'Yankee' rôles. John Gilbert made his début in Boston in 1828, and later ripened into one of the most accomplished actors of 'old man' parts on any stage. William E. Burton came to this country in 1834. Charles Burke, one of the finest of American comedians, began his short career in 1836. He was a half-brother of the present Joseph Jefferson, who about the same time made his appearance as a boy upon the stage, and has more than realized the promise of his theatrical ancestry. Already Charlotte Cushman, celebrated as the greatest of American actresses, had begun to show her power. In 1838 Mary Cecilia Taylor made her début, and soon became a popular favorite, a clever and versatile though not a great actress. Still the stage was largely dependent on English materials when John Brougham came over in 1842. He was the first author to put life into the playbills, besides being one of the best comedians of the day, and, though he was born an Irishman, his work was essentially American, especially his inimitable burlesques, *Pocahontas* and *Columbus*. In 1845 the elder John Drew appeared in this country. Meanwhile Anna Cora Mowatt was becoming the reigning favorite in genteel comedy and light tragedy, and in 1848 she appeared in England with E. L. Davenport, who had already at home made a reputation as a versatile actor.

During the second half of the century just passed, the annals of the American stage offer a long list of names worthy of respect as those of gifted and admirably trained artists. In tragedy it is necessary only to recall Edwin Forrest, who still played till after 1870; John McCullough, best remembered for his manly impersonation of Virginius; Edwin Booth and Lawrence Barrett, two of the most scholarly of American actors; and at the present time, Richard Mansfield, who is, however, not only a tragedian, but a successful actor in other branches of the regular drama. In legitimate comedy, John Gilbert and Joseph Jefferson led the way, and were followed by Lester Wallack, E. A. Sothern, William Davidge, William J. Florence, James Lewis, John T. Raymond, Sol Smith Russell, John Drew, and N. C. Goodwin. In lighter comedy and farce, some of the names suggesting themselves are those of Edward Harrigan, William H. Crane, Neil Burgess, Henry E. Dixey, and Francis Wilson. Of the talented and accomplished women who have graced the stage, Charlotte Cushman was still the foremost a half-century ago. Among the others most noted have been Mrs. Anne Gilbert, who at her eightieth birthday (in 1901) was still playing; Elizabeth Crocker Bowers, Maggie Mitchell, Matilda Heron, Laura Keene, 'Lotta' Crabtree, Rose Coghlan, Clara Morris, Fanny Davenport, Mary Anderson, Ada Rehan, Minnie Maddern Fiske, Annie Russell, Julia Marlowe, Mrs. Leslie Carter, and Maude Adams. A continually increasing number of well-known foreign actors and actresses have made American tours; some of them, like Madame Janauschek and the late Dion Boucicault, the playwright, have remained in this country.

The list of American dramatists not already referred to includes David Paul Brown, George H. Boker, Epes Sargent, Henry Guy Carleton, Bronson Howard, Bartley Campbell, H. C. De Mille, David Belasco, and Clyde Fitch, besides numerous other well-known literary people who have tried their hand at dramatic composition. A phase of dramatic production which has been noted in recent years is the increasing number of dramatizations of popular novels, not to mention the barnstorming *Uncle Tom's Cabin* companies which have been on the boards for more than a generation. Judged by popularity, many of the most successful productions of late years have been those of the lighter order, such as the uproarious farces of Charles H. Hoyt and some of Edward Harrigan's portrayals of low life. From many of these it is not a long step to that curious and often unconsciously Oriental mixture of vaudeville and drama, the 'continuous' performance. Probably nothing else the American stage has seen, however, is so truly a product of the soil and so thoroughly national as Denman Thompson's *Old Homestead* and similar plays. From a literary point of view these dramas of country life are seriously defective; but their genial humor and simple fidelity to nature have charmed both the general public and the most scholarly of critics. Some of the other most successful playwrights and adapters have been practical managers of theatres, like Wallack, Daly, and Belasco. To the late Augustin Daly, both as author and as manager, the American stage owes no small debt. His was the maintenance and training of a company that could, without fear of contradiction, be ranked with the best of the subsidized companies of Europe. Never before had our country felt and understood the possibilities of dramatic art as since Mr. Daly in his Shakespearean revivals revealed them. The absurd 'star' system, by which one great actor or actress was expected to atone for the shortcomings of a supporting company of incapables, received through him a serious blow, and the public has learned how much of the success of any play depends upon the *ensemble*, the proper adaptation of one part to another, and the intelligent rendering of every detail.

For a fuller treatment of matters relating to the drama, the reader is referred to the articles that deal with the individual actors and authors mentioned above, and to those entitled THEATRE; BALLET; BURLESQUE; CHORUS; CLAQUE; COMÉDIE FRANÇAISE; FARCE; INTERLUDE; MASQUE; MIRACLE-PLAYS; MYSTERY; PANTOMIME; etc. On the theory and form of the drama, consult: Freytag, *The Technique of the Drama* (English trans., Chicago, 1895); Price, *The Technique of the Drama* (New York, 1892); Woodbridge, *The Drama, Its Law and Its Technique* (Boston, 1898); Schlegel, *Lectures on Dramatic Art and Literature* (Eng. trans., London, 1846, etc.); Pougin, *Dictionnaire historique et pittoresque du théâtre* (Paris, 1885); Adams, *Dictionary of the Drama* (New York, 1903); Spemanns, *Goldenes Buch des Theaters* (Berlin, 1902). On the history of the drama: Klein, *Geschichte des Dramas* (Leipzig, 1865-86); Prölss, *Geschichte des neueren Dramas* (Leipzig, 1880-83); Royer, *Histoire universelle du théâtre* (Paris, 1869-78); Hastings, *The Theatre, Its Development in France and England, and a History of its Greek and Latin Origins* (London, 1902); Donaldson, *The Theatre of the Greeks* (8th ed., London, 1875); Haigh, *The Attic Theatre* (Oxford, 1889), and *The Tragic Drama of the Greeks* (Oxford, 1896); Patin, *Etudes sur les tragiques grecs* (Paris, 1885-94), and *Etudes sur la poésie latine*, vol. ii. (Paris, 1883); Moulton, *The Ancient Classical Drama* (Oxford, 1890); Lévi, *Le théâtre indien* (Paris, 1890); Gotschall, *Das Theater und Drama der Chinesen* (Breslau, 1887); Chambers, *The Medieval Stage* (London, 1902); d'Ancona, *Origini del teatro in Italia* (2d ed., Torino, 1891); Schack, *Geschichte der dramatischen Litteratur und Kunst in Spanien* (Berlin, 1845-46); Schaeffer, *Geschichte des spanischen Nationaldramas* (Leipzig, 1890); Matthews, *The Theatres of Paris* (New York, 1880), and *French Dramatists of the Nineteenth Century* (2d ed., New York, 1891); Lucas, *Histoire philosophique et littéraire du théâtre français* (Paris, 1862-63); Berendt, *Schiller-Wagner, ein Jahrhundert der Entwicklungsgeschichte des deutschen Dramas* (Berlin, 1901); Litzmann (editor), *Theatergeschichtliche Forschungen* (Hamburg, 1891-1901); Collier, *The History of English Dramatic Poetry to the Time of Shakespeare, and Annals of the Stage to the Restoration* (London, 1831); Ward, *History of English Dramatic Literature* (London, 1875); Symonds, *Shakspere's Predecessors in the English Drama* (London, 1884); Archer, *English Dramatists of To-day* (London, 1882); Doran, *Annals of the Stage* (Lowe ed., London, 1888); Adams, *Dictionary of the Drama*, vol. i. (Philadelphia, 1904); Lewes, *On Actors and the Art of Acting* (New York, 1878); Baker, *English Actors from Shakespeare to Macready* (New York, 1879); Baker, *The London Stage, Its History and Traditions from 1576 to 1888* (London, 1889); Scott, *The Drama of Yesterday and To-day* (London, 1899); Matthews and Hutton (editors), *Actors and Actresses of Great Britain and the United States* (New York, 1886); Seilhamer, *History of the American Theatre* (Philadelphia, 1888-91); Dunlap, *History of the American Theatre* (New York, 1832); Ireland, *Records of the New York Stage, 1750-1860* (New York, 1886); Hutton, *Curiosities of the American Stage* (New York, 1891); McKay and Wingate (editors), *Famous American Actors of To-day* (New York, 1896); Strang, *Famous Actresses of the Day in America* (Boston, 1899), and *Famous Actors of the Day in America* (Boston, 1900); Hapgood, *The Stage in America, 1897-1900* (New York, 1901); Clapp and Edger, *Plays of the Present* (New York, 1902); Brown, *History of the New York Stage*, 3 vols. (New York, 1903); Publications of the Dunlap Society (New York); Lowe, *A Bibliographical Account of English Theatrical Literature* (London, 1888); Winter, *Shadows of the Stage* (1892-3-5).

DRAMATIC ARTS, AMERICAN ACADEMY OF. A training school for the stage, established by Franklin Sargent in New York City in 1884, and chartered by the regents of the State of New York in 1889. It offers a two years' course of systematic instruction. In 1897 the Empire Theatre Dramatic School was placed under the management of the Academy. The senior class offers several public performances.

DRAMATIC POESY, AN ESSAY ON. A treatise (1667) by Dryden in the form of a dialogue, supposed to have taken place on the Thames between Neander, Lisideius, Crites, and Eugenius; i.e., Dryden, Sedley, R. Howard, and Buckhurst. It discusses the relative merits of English and French dramatists, gives Jonson the palm over Shakespeare, prefers the moderns to the ancients, and strongly advocates the employment of rhyme in dramatic poetry. Sir Robert Howard took offense at the author's treatment of the latter subject, and wrote a rejoinder, which Dryden answered in *A Defense of the Essay on Dramatic Poesy.*

DRAMMEN, drăm'men. A seaport town of Norway, situated on the Drammen, at its entrance into the Drammen Fjord, an arm of the Christiania Fjord, 33 miles southwest of Christiania (Map: Norway, D 7). The town occupies a site between high hills, and has been rebuilt since the fires in 1866 and 1870. The three quarters of the town, which are divided by the river, are joined by bridges. Drammen manufactures chiefly lumber, iron-work, tobacco, cotton, and woolen textiles. It has sawmills and ship-yards, and exports much lumber. Its trade is largely with England and Holland. Population, in 1891, 20,441; in 1901, 23,091.

DRA'PER, ANDREW SLOAN (1848—). An American educator and lawyer. He was born at Westford, N. Y.; was admitted to the bar in 1871, and was one of the judges in the Court of Alabama claims in 1884. Subsequently he was State Superintendent of Public Instruction in New York from 1886 to 1892, and had charge of the schools in Cleveland, Ohio, during the two following years. In 1894 he was chosen president of the University of Illinois, serving until 1904, when he was elected first commissioner of education for the State of New York. At St. Louis in 1904 he was awarded one of the two grand prizes for unusual services to the cause of education. His publications include: *The Spirit of the Teacher; Science and the Elementary Schools; Legal Status of the Public Schools; The Rescue of Cuba; The Origin and Development of the New York Common School System* (1889); *Public School Pioneering in New York and Massachusetts* (1892); *American Schools and American Citizenship* (1891); *The Organization and Administration of City School Systems* (1888); and *American Universities and the National Life.*

DRAPER, DANIEL (1841—). An American meteorologist, born in New York City, a son of John William Draper, under whom he studied science, obtaining his degree from the University of the City of New York. He aided his brother Henry in the construction and equipment of the observatory at Hastings-on-the-Hudson, and after acquiring considerable practical experience as an engineer, was in 1869 appointed director of the New

York Meteorological Observatory. The self-recording meteorological instruments employed in that institution are based chiefly upon his designs. Among his literary contributions to science may be mentioned the well-known treatise on the *Cause of Pneumonia,* which has also been translated and reprinted abroad.

DRAPER, HENRY (1837-82). An American scientist, the son of John William Draper. He was born in Prince Edward County, Va.; studied in New York from 1852 to 1854, and began the practice of medicine in 1858. He was then professor of physiology in New York University from 1860 to 1866, professor in the medical school from 1866 to 1873, and afterwards professor of chemistry. He constructed large telescopes and devoted himself to celestial photography, rendering important service to astronomy and astrophysics. He published *A Text-book on Chemistry* (1866), and many valuable papers.

DRAPER, JOHN CHRISTOPHER (1835-85). An American physician, born in Virginia. He was a son of John William Draper. He entered the academic department of New York University in 1852, but subsequently abandoned the study of the classics, attended the course in medicine, and graduated in 1857. He was professor of analytical chemistry, New York University, 1858-61; of chemistry at Cooper Union, New York City, 1860-63; of natural science at the College of the City of New York, 1863-85; and of chemistry in the medical department of New York University, 1866-85. He contributed numerous articles to medical and scientific journals, was editor, in 1872-73, of the *Year-Book of Nature and Science,* and for three years had charge of the department of natural science in *Scribner's Monthly.* His important works include: *The Production of Urea* (1856); *Experiments on Respiration* (1856); *Text-Book on Anatomy, Physiology, and Hygiene* (1866); *A Practical Laboratory Course in Medical Chemistry* (1882); and a *Text-Book of Medical Physics* (1885).

DRAPER, JOHN WILLIAM (1811-82). An American chemist, physiologist, and philosophical writer. He was born near Liverpool, England, and was educated at a Wesleyan school at Woodhouse Grove, and at London University. In 1831 he joined some of his relatives who had emigrated to America, and in 1836 took his degree of doctor of medicine in the University of Pennsylvania and was appointed professor of natural philosophy, chemistry, and physiology in Hampden-Sidney College, Virginia. In 1839 he removed to New York, where he was connected with the college department of the University of the City of New York; and in 1841 joined Drs. Mott, Patterson, and others in founding the medical school of New York University, in which he was at first professor of chemistry, and after 1850 of physiology. He published a *Treatise on the Forces which Produce Organization in Plants* (1844); *Text-Book of Chemistry* (1846); a *Text-Book of Natural Philosophy* (1847); and *Human Physiology, Statical and Dynamical: or, the Conditions and Course of Life of Man.*

Dr. Draper's lasting contributions to physiology and to pure chemistry were few and relatively unimportant. On the other hand, his name is associated with a number of results of the greatest value in physical chemistry, especially in photochemistry (q.v.). The chemical action of light early attracted his attention and for many years formed his favorite subject of investigation. He succeeded in demonstrating that different colors of light have an unequal influence on the decomposition of carbonic acid by the green pigment of plants. The spectra of light emitted by incandescent substances engaged his attention as early as 1847, and his memoirs show that at that early date he had already grasped the wonderful possibilities of spectrum analysis in both chemistry and astronomy. He further succeeded in showing that all parts of the spectrum, the invisible as well as the visible ones, are capable of chemical action. His improvements in the art of photography entitle him to an eminent place among the great inventors of the nineteenth century. The principle of photography was established by the Frenchman Daguerre; but Daguerre's process was imperfect and practically incapable of useful application. It was Draper's improvements that rendered it possible to apply photography to the representation of the human countenance, and the first photograph was taken by Draper in 1839, in the old building of the New York University. A valuable collection of Draper's publications was published in 1878, under the title, *Scientific Memoirs, Being Experimental Contributions to a Knowledge of Radiant Energy.*

Though a life-long teacher of science and a prolific writer on scientific subjects, Draper will, perhaps, best be remembered as the author of three works which more properly belong to the domain of philosophical history. The first of these and the most important is *The History of the Intellectual Development of Europe* (2 vols., 1863), in which he attempts to apply the methods of science to human history, and to prove inductively that "social advancement is as completely under the control of natural law as is bodily growth." Much of his data, both scientific and historical, has been superseded, and some of his conclusions are discredited, but the work is characterized by considerable erudition and a remarkable clearness of presentation, and is still much read. His *History of the American Civil War* (3 vols., 1867-70), though it gives a graphic and fairly accurate account of the military operations, is chiefly valuable for its elaborate analysis of the causes, immediate and remote, which made a war between the North and the South inevitable. The most popular of his works, however, is his *History of the Conflict Between Religion and Science* (New York, 1874), a candid, philosophical, and fairly comprehensive treatment of the subject. Consult Barker's "Memoir," in volume ii. of the *Biographical Memoirs of the National Academy of Science.*

DRAPER, LYMAN COPELAND (1815-91). An American historian and educator. He was born at Hamburg (now Evans), Erie County, N. Y., and was educated at Granville College (now Denison University), Ohio. In 1840 he conceived the idea of writing a history of the Indian wars of the United States, and with this in view visited many pioneers, Indian chiefs, and others, who were in any way identified with the early Indian campaigns. He continued these investigations for twenty-five years, traveling thousands of miles through every part of the United

States. The information thus compiled is said to have covered a period from about the middle of the eighteenth century to the death of Tecumseh. From 1854 to 1887 he was corresponding secretary of the Historical Society of Wisconsin, and practically became the founder of the extensive library of that society, which upon his accession was limited to only a few volumes. The results of his extensive tours to collect material on the early history of Wisconsin were published in the first ten volumes of the *Wisconsin Historical Collections*, which he edited. Unfortunately, only a few of the works projected by him were completed at his death. Among those published, perhaps the best-known is that entitled *King's Mountain and Its Heroes* (1881).

DRA′PIER LETTERS. See SWIFT, JONATHAN.

DRASCHE, drăsh′e, ANTON (1826-1904). An Austrian physician. He was born at Lobendau, Bohemia, and was educated at Prague, Leipzig, and Vienna. In 1858 he became lecturer of pathology and therapeutics at the University of Vienna, and in 1874 he was appointed extraordinary professor of epidemiology at that institution. During the cholera epidemics of 1850, 1854, 1855, 1866, and 1873, he conducted special hospitals or medical departments for the treatment of patients, and his numerous papers on the treatment of cholera, published chiefly in the *Medizinische Wochenschrift*, are considered valuable contributions to the literature of the subject. He was also an acknowledged authority on diseases of the heart, and the introduction of the tincture of strophanthus into the therapeutics of these diseases is due to his initiative. A collection of his medical treatises was published at Vienna in 1893.

DRAUGHTS. See CHECKERS.

DRAVE, drȧv (Ger. *Drau*). An important affluent of the Danube, rising in the eastern part of Tyrol, at a high altitude on the southern slope of the main ridge of the Hohe Tauern Alps, and flowing through the Pusterthal toward Lienz, where it is joined by the Isel (Map: Austria-Hungary, F 4). It then flows a little south of east through Carinthia and Styria, passing Villach and Marburg; then, turning toward the southeast, it forms the boundary between Croatia and Slavonia on the right and Hungary on the left, and joins the Danube 10 miles east of Esseg, after a course of 465 miles. Its principal affluent is the Mur, from the left. In the first part of its course, the Drave is but a mountain torrent, rushing wildly through the craggy passes of Tyrol; but from Villach it is navigable to its mouth, a distance of 380 miles. The navigation facilities have been much improved by the Government. The valleys through which it flows in its course through Carinthia, Styria, and Croatia, are distinguished by great fertility and picturesque scenery, while in Slavonia it is frequently bordered by dense forests.

DRAVID′IANS (Skt. *Drāviḍa*). The name given to a large group of non-Aryan races of Southern India, including those speaking Tamil, Telugu, Kanarese, Malayālam, Tulu, Kudagu, and six or eight uncultivated dialects of the ruder tribes, like Tōda, Kōta, Khond, and Gond, together with Orāon and Rājmahāl. Geographically the Dravidian population occupies almost the entire peninsular part of India, or that portion to the south of the Vindhya forest and the Nerbudda River, as a glance at the linguistic and racial maps of Cust and Constable will show. (See, also, INDIA.) The Orāons and the Rājmahāl hill tribes are sporadic representatives of Dravidians in the Province of Bengal tc the north. Like the main body to the south, they are remnants left over from an earlier time when the Dravidians occupied a much larger part of India than at present; as a whole the Dravidian stock has been pushed forward or overrun by the advance of the Aryan incomers from the north. Ethnologically the Dravidians are interesting, especially such a tribe as the Tōdas, in the Nīlgiri hills, who represent one of the lowest stages of civilization. In some districts the Dravidians are distinguishable by language rather than by physical characteristics from the neighboring Hindu (Aryan) peoples, while in others they are so dark-skinned and so constituted in hair, features, etc., as to lead many ethnologists to consider them related to the Australians and to group the latter and the former as one race. The anthropological kinship is maintained by Hale (1891) and Brinton (1890), the former holding that the Australians are Dravidians degraded by their environment. Keane (1896) sees a large Caucasian (white) element in the Dravidians, who, like the Magyars in Europe, "have been assimilated to the Caucasian type, and have accepted Aryan culture, while preserving intact their non-Aryan speech." Hale thinks that the influence of the Dravidians upon the intruding Aryans has been much underestimated. Some authorities consider the so-called 'Kolarian' peoples to be related to the Dravidians, while others look upon them as pre-Dravidian aborigines. The religion of the Dravidians embraces all phases from the rude nature-worship of the hill tribes to the borrowed Buddhism, Hinduism, and Islamism of the more civilized peoples. The Dravidians (Tamils) have even developed a style of architecture. The folklore and mythology of some of these peoples is rich and varied, of the Tamils in particular.

The Dravidian languages belong to a group quite independent of the Aryan or Indo-Germanic (q.v.); the affinities which these tongues show with Sanskrit are due to geographical contact, and not to linguistic kinship. Owing to certain characteristics or peculiar features of these languages, some scholars, especially the best authority, Caldwell, have sought to establish an affiliation between the Dravidian and what is sometimes called the Scythian or Turanian family of tongues. Hardly any two of the dozen Dravidian languages are intelligible to those who speak the other, except in a general way. The two which stand highest in cultivation and importance are the Tamil and the Telugu. More than half the number of Dravidian-speaking peoples employ the one or the other of these two vernaculars. The Tamil covers the lower eastern side of the Indian peninsula from Madras to Cape Comorin and over into Ceylon. It is spoken by some 16,525,500 people. The Telugu, which was spoken in 1901 by 20,696,872 persons, adjoins this language to the north and extends from Madras upward beyond the dominions of the Nizam of Hyderabad. The Kanarese, or

Canarese, spreads westward from the Telugu district to the sea, and is current among some 10,365,047 persons. The Malayālam, spoken by 6,029,304 individuals, runs in a narrow strip down the lower southwestern part of the peninsula, almost from Mangalore to the Cape.

With regard to Dravidian literature, such works as exist in the several languages are comparatively modern, despite the antiquity of the Dravidian civilization. Hardly one can be said to be more than a thousand years old. The Tamil and the Telugu, in fact, are the only two Dravidian languages that can be said to have any real literature. Tamil claims to have compositions as old as the legendary sage Agastya; but the treatises and grammatical writings attributed to him can hardly be dated prior to the tenth century A.D. Probably not far removed from the same date is the *Kural* of Tiruvalluvar, comprising poetical aphorisms in 1330 distichs (trans. by Ch. Graul, Leipzig, 1865), and likewise the "Cintāmani," a romantic poem of some 15,000 verses, written by an unknown author, or again the ethical poem "Nāladiyār," which has been rendered into English by Pope (Oxford, 1893). Two centuries later the Tamil poet Kambar made a version, or adaptation, of the Sanskrit epic "Rāmāyana," and again in the sixteenth century there was a literary revival connected with the name of the poet-king Ati-Vīra-Rāma Pāndya. At the opening of the eighteenth century we find, besides the native Tamil poet Tāyumānavar, the name of a foreigner, the celebrated Italian Jesuit missionary Beschi, who wrote poetry and prose of so excellent a quality as to win him a place in Tamil literature. In more recent times, it may be added, the educational influences of the Madras College have done much for Tamil through translating into it the English Bible and various religious works, and Tamil may be said to possess a future as a vernacular literature. Second comes Telugu, in which the oldest extant poetical work is a version made from the great Sanskrit epic *Mahābhāratā*, by Nannappa, or Nannaya Bhatta, presumably in the twelfth century A.D. Kanarese may also claim the name of a poetical writer, Keśava, who probably belonged to the same century. In the Malayālam language, moreover, there is a poetical account of Rāma, the heroic Prince of India, based upon the Sanskrit, and there are likewise versions of both the greater Sanskrit epics. The other Dravidian languages possess either no literature at all or none worth mentioning.

Bibliography. The standard book on Dravidian is the large work by Caldwell, *Comparative Grammar of the Dravidian, or South Indian Family of Languages* (2d ed., London, 1875); Forsyth, *Highlands of Central India* (London, 1871); Dalton, *Descriptive Ethnology of Bengal* (Calcutta, 1872); Reclus, *Primitive Folk* (New York, 1890); Kingscote, *Folk-Lore of Southern India* (London, 1890); Oppert, *Original Inhabitants of India* (London, 1893). There is also a considerable special literature for each of the civilized Dravidian peoples. On the Dravidian languages, consult: Caldwell, *Comparative Grammar of the Dravidian Family of Languages* (London, 1875); Cust, *Modern Languages of the East Indies* (London, 1878); Hunter, *Comparative Dictionary of the Non-Aryan Languages of India* (London, 1868). For Tamil, consult: Pope, *First Lessons in Tamil* (Oxford, 1891), and other works by the same author, including his English translation of the "Nālādiyār" (Oxford, 1893); Hultzsch, *South Indian Inscriptions, Tamil and Sanskrit*, translated (Madras and Leipzig, 1890-95); Graul, *Tiruvalluver's Kural*, translated (Leipzig, 1865); on Telugu: Arden, *Progressive Grammar of the Telugu Language* (Madras, 1873); Brown, *Telugu-English and English-Telugu Dictionary* (Madras, 1852-54); Carr, *Collection of Telugu Proverbs* (Madras, 1868). On Kanarese or Canarese and Malayālam there are several works published in Mangalore, Southern India.

DRAWBACK. A term used to designate the repayment of taxes, whether import duties or internal taxes, upon goods which are exported. Drawbacks upon goods imported which are reshipped in the original packages are rendered unnecessary by the warehouse system, which permits the deposit of goods in bond, without payment of taxes until they are withdrawn either for export or for home consumption, in which latter case the taxes must be paid. If, however, the imported goods are manufactured before the reëxportation, drawbacks are necessary if the payment is to be remitted. In the case of goods subject to internal tax the granting of drawbacks on the exportation of the goods serves the purpose of freeing the exporting manufacturer from an increased cost of production through taxation, which his competitors do not have to bear. Great care must be exercised in the mode of assessing the drawback to avoid, on the one hand, taxation, and on the other a bounty upon exportation. If the amount of the drawback is greater than the tax paid, it becomes a direct encouragement to exportation, which may not be contemplated by the law. It is in this way that the so-called sugar bounties in Germany and some other Continental countries arose.

In the United States drawbacks are allowed on imported articles exported for sale abroad, and on firearms, agricultural implements, etc., made of foreign materials with stocks and handles of wood grown in this country, provided the imported materials exceed one-half of the value of the whole material used. Every one entering merchandise for importation or exportation with right of drawback is required to deposit the original invoice of such merchandise with the collector, who causes an inspection to be made by the proper officer and the articles to be compared with their respective invoices before granting the permit for lading. No drawback is allowed on merchandise entitled to debenture under existing laws unless it be exported within three years from the date of importation. Drawbacks are also admitted for the exportation of distilled liquors and manufactured tobacco on which internal revenue taxes have been paid.

DRAWBRIDGE. See Bridge.

DRAW'CANSIR. A typical arrant braggart in Buckingham's burlesque *The Rehearsal*, a parody on Almanzor, the hero in Dryden's *Conquest of Granada*.

DRAWING (from *draw*, AS., Goth. *dragan*, Icel. *draga*, to drag, probably connected with OHG. *tragan*, Ger. *tragen*, to carry). The delineation of form upon a given surface, usually plane, by means of lines and tints or shades. Painting and drawing are broadly distinguished by the use of varied color in painting, reproducing the colors of the object represented, while in drawing only the form and light and shade (or 'modeling') are represented. The forms delineated may be visible objects, forms imagined and presented as if actually seen, or purely arbitrary or abstract forms, as in ornamental patterns and mathematical diagrams. As the delineation of form lies at the foundation of all the plastic arts, drawing is the most important single branch of study in schools of art and of engineering. Since, moreover, the study of drawing trains the faculties of observation and memory to a high degree, and develops an effective coordination of the action of hand and eye, it has come to be recognized as of the highest educational value in any system of mental discipline. It is therefore systematically taught in the public schools of nearly all countries that make any pretensions to a well-organized educational system.

The drawing of visible objects is really the graphic recording of mental impressions received through the eye. The draughtsman seeks to produce upon the paper, by means of lines and tints, visual images which shall awaken in the beholder mental images and impressions as nearly as possible like those evoked directly by the objects represented. But since the limitations of drawing in black and white on a plane surface forbid the complete presentation of all the visible facts and aspects of the original object, it is evident that the desired mental impression must be produced largely by *suggestions*, which stimulate the beholder's imagination to supply whatever is lacking in the representation. The drawing, in spite of being merely (for instance) an aggregation of black lines and dots on white paper, and but an inch or two in height and width, may so visibly suggest the outline, foliage, masses, light and shade of a tree, that it evokes in the mind the impressions one experiences in seeing such a tree, and the imagination at once supplies the size, distance, detail, and color which the drawing lacks. Artistic power in drawing consists largely in the ability thus to create by suggestion a vivid impression of reality. A *sketch* is a drawing which attempts to present in a summary way only partial and momentary aspects of the thing represented. An effective sketch is one in which the simplicity and vigor of the artist's personal interpretation of what he sees has not been sacrificed in the effort after elaborate finish. The judicious choice of what to show and what to omit calls for a highly developed taste, and can be mastered only by long experience. A master's sketch is worth a score of highly elaborated drawings by 'prentice hands.

Free-Hand Drawing. Drawing in which the hand receives no assistance from mechanical appliances is called free-hand drawing. It lies at the foundation of all the arts of plastic design, sculpture not excepted, and constitutes an art in itself. Its greatest masters, like Raphael, Leonardo da Vinci, and Michelangelo, have been among the geniuses of their times. Even the greatness of such colorists as Titian and Veronese depends in large measure upon their consummate draughtsmanship. See Painting.

The restrictions under which the artist labors in seeking to represent in black and white upon a plane surface the multitudinous aspects of visible objects have already been referred to. The different kinds and schools of drawing are distinguished by the ways in which these restrictions are evaded or overcome. In outline drawings and in some sketches, only the exterior outlines and contours or salient edges and markings of an object or scene are shown. The power which these may have of evoking complete mental pictures is indicated in the simple outline drawings on Greek vases and by black silhouettes of faces and figures. The power of pure line, even divested of accompanying color, to suggest the most varied modeling of surfaces, and to express the minutest detail, is admirably exemplified in Japanese pictorial art. The European schools, on the other hand, lay great stress upon *values*, or the rendering of the varied luminosities and gradations of light and dark in the objects represented, by corresponding gradations of the tones of the drawing; that is, of the mixtures of black and white produced by the use of the pen-and-ink, pencil, crayon, charcoal, or sepia-brush upon the paper. Even different colors may be to a certain extent suggested, or rather interpreted, in black and white by a careful rendering of their apparent values; a dark red, for instance, being indicated by darker shading than a light blue or a yellow. The great artists of the Renaissance stand midway between the Japanese exponents of pure line and the modern European interpreters of values. Their drawings are wonderful for the purity, vigor, and delicacy of their lines, as well as for the skillful though somewhat conventional 'modeling' of the forms as expressed by shading. See the articles Line, and Impressionist School of Painting.

Technic of Free-Hand Drawing. The fundamental principles of the art are the same, whatever the medium employed. Good drawing demands, first of all, a trained sense of form; that is, the power to observe, to understand and appreciate, to remember, and to represent, form in general; or, in other words, the mastery of proportion. In drawing from any object or model, the first essential is to observe, and sketch in, the dominant structural lines, contours, and masses, including the conspicuous high lights and deeper shades and shadows. The more important details are next added and corrected, and the minor details are left to the last. In executing these various stages of the drawing, lightness of touch and sureness of line are important qualities, attained only by long and patient discipline. Taste and imagination are both exercised in the choice of what to show and what to omit, while experience alone endows the artist with the knowledge of the most effective methods for expressing the facts and aspects he is seeking to record.

But the detailed technique of drawing varies greatly with the medium employed. The chief instruments are the pencil, pen, black crayon, charcoal, and brush. Of these, the pen is the most exacting, since it makes an absolutely black mark on the white paper, and tints must be expressed by dots, closely serried lines, and cross-hatching. The masters of pen drawing are invariably masters of pure line. With charcoal or crayon sauce the artist must, as it were, paint on his paper, fine lines being out of the question; so also with the brush, in sepia and other 'wash' drawings. The pencil and crayon occupy a middle ground, requiring the use of the line, but permitting broad, soft strokes and stumped or rubbed-in shading. Very effective drawings are made by using a tinted paper—gray or pale blue—on which the high lights are laid on in white with chalk or Chinese white, and the darker shades and masses with the pencil, while the tone of the paper is left to represent the intermediate values. The great masters of the Renaissance, lacking the 'lead' or plumbago pencil, which is a modern invention, used the lead point or a silver point on parchment or heavy paper, giving pale gray line; or more often, sanguine or red chalk. The quill took the place of the modern steel pen, making a softer and broader stroke.

INSTRUMENTAL DRAWING. For scientific purposes, for the working drawings from which buildings and machinery are to be made and erected, and for all purposes requiring great exactitude of representation, a different sort of delineation is necessary from that of the artist working with free hand. Free-hand drawings are personal interpretations of visible form; in this lies their charm. Their value is artistic, not scientific; no two drawings of the same object by different persons, or by the same person at different times, can be absolutely alike. In *mechanical* or *instrumental* drawing, on the other hand, mathematical exactness of line and dimension is secured by the use of various instruments, the most important of these being the T-square, rule, and triangles, used in drawing right lines; compasses for drawing circles and arcs of circles; dividers for laying off exact distances, the scale for determining and measuring dimensions, the protractor for laying off angles, and the ruling-pen for drawing clean and faultless lines in ink; besides a considerable number of special appliances which cannot here be enumerated. The object of drawings executed by these means is not to present the aspects of objects as we see them, but to furnish scientifically correct graphic records of the actual proportions and form-relations of objects, usually at a much reduced scale. This is effected by means of *projections* upon imaginary vertical and horizontal planes, called *planes of projection*, two dimensions of the object being shown in each projection. These projections comprise *plans* or top views, showing the object as if seen from an infinite height above; *elevations* or front, side, and rear views, as if seen from a point infinitely distant horizontally; and *sections*, which show the object as if sliced in two and the nearer half removed, exposing the interior structure. These projections show the correct geometrical relations of the various dimensions and parts of the structure or object, and by the use of two or more projections *all* its dimensional relations are exhibited. To assist the eye in interpreting these highly conventional drawings—which are really not pictures, but diagrams—they are often (especially in architectural drawings) made with the shadows cast as if by sunlight, falling on the object in each projection at an assumed and uniform angle. This angle is usually so taken that the rays, falling from in front of the vertical plane, downward to the right, are projected at 45° to the ground line on either projection. The delineation of these conventional shadows is a branch of descriptive geometry, and has received the name of *sciography* ('shadow writing').

Instrumental drawing is divided, according to its various applications, into *mechanical* drawing, a general term for all engineering draughting; *machine* drawing or the preparation of the working drawings for the construction of machinery; *architectural* drawing, *ship draughting*, *topographical* drawing, etc.; and the various purely mathematical divisions of *descriptive geometry*, *stereotomy* or the preparations of drawings for cut stonework, *crystallography*, and the like.

In architectural drawing and in most forms of machine drawing and engineering, the purpose in view is to furnish diagrams of all parts of a structure or machine to be erected, drawn to exact scale and marked with the proposed dimensions, for the guidance of those who are to execute the work. For this purpose there are prepared as many plans as may be necessary, elevations of the various faces of the structure, and sections showing its internal arrangement. These are all drawn to a small scale, which may be from one-thirty-second of an inch to the foot to one-quarter or even one-half of an inch to the foot (with approximately corresponding scales where the metric system is used). Many of the details of construction are shown in drawings to a larger scale, one foot being represented by three-quarters of an inch, one inch, or even two or three inches; and there are also prepared a large number of drawings of structural details of the full size of the intended work. At the mills, stone-yards, and shops where much of the work is executed, these drawings are supplemented by *shop drawings* prepared by the several contractors to assist in laying out the work, and to serve as exact patterns for its execution. The largest shop drawings are those made in the mold-lofts of the ship-builders, each rib being drawn out to its full size on the smooth floor of the loft. The drawing of decorative details of carving, inlay, and other ornament in architectural work is of necessity chiefly free-hand work, and involves an artistic element not called for in the purely scientific drawings above described.

PERSPECTIVE DRAWING. Perspective drawing stands midway between free-hand or pictorial drawing and instrumental drawing, since it aims to represent the actual aspect of an object from a given point of view, and yet to do this is a matter less of personal and artistic interpretation than of scientific determination. The object is shown with all the angular distortion and foreshortening which it exhibits to the eye placed at the given point of view; but the exact angles, dimensions, distortions, and foreshortening of each part are determined by mathematical processes, and not by mere visual impressions. It thus forms a department of descriptive geometry, but the object is represented, not as projected by parallel lines on two planes of projection, but as projected, by rays converging to the eye, upon an assumed picture-plane (or rarely upon a cylindrical or even spherical surface) intersecting these rays and represented by the paper. The picture is absolutely correct only for the eye placed at the given point of view. All parallel lines not parallel to this plane are shown converging to points called *vanishing* points, and parallel planes in like manner converge toward vanishing lines or *traces*. These are all determined by rules and processes too intricate to be here detailed. (See PERSPECTIVE.) There is also a form of angular projection called *isometric* projection, which shows all three dimensions at once, as does a perspective drawing, but with a uniform scale for all parts of the picture, while in true perspective the same actual dimension appears of varying size according to its distance from the eye.

A perspective drawing, thus scientifically laid out as to its outlines, may be finished, as to line, color, light and shade, and accessories, in a pictorial and artistic manner, as in free-hand drawing; it then emerges from the category of scientific drawing into that of fine art. Indeed, no artist can master the correct portrayal of form, especially of scenery and buildings, without training in perspective; it is accordingly an important branch of study in all schools of art. It is absolutely indispensable to the scene-painters, and forms the basis of the illusory effects of the stage setting. The artists of the Renaissance were the first to reduce its principles to system, and many of them were carried away by the fascination of its possibilities; the later artists, especially the Venetians (notably Paolo Veronese and later Tiepolo), and the mighty Michelangelo, employed its resources with extraordinary effect in their great decorative paintings. Japanese drawings are interesting for their treatment of perspective, the point of view being in almost all cases assumed at a high elevation, giving an approximation to the effect of what is called 'bird's-eye perspective.'

THE TEACHING OF DRAWING. The delineation of an object actually seen involves, first, *observation*, which comprises perception and attention; secondly, the memorizing or mental *retention* of the visual impression while the eye is momentarily withdrawn from the object to the paper; and thirdly, the *coördination* of the movement of the hand with the outlines of the memorized image. In drawing imaginary forms or designs originating in the artist's mind, a mental image takes the place of the visible object, and imaginative and creative power—the ability to visualize clearly and distinctly in the 'mind's eye' these mental images—is an important element in all draughtsmanship of the highest order. Skill in drawing is thus in quite as large measure dependent on intellectual factors as on skill of hand, and no system of teaching drawing which confines itself to the mere discipline of hand and eye can be considered as scientifically or philosophically correct. The draughtsman draws best what he *knows* best, because well-known forms are those most easily and clearly visualized, so that a thorough acquaintance with the widest range of forms is as essential to consummate draughtsmanship as is manual skill in portraying them. Thus it is that constant drawing from life, from nature, from the object, not only gives facility of execution, but, by enlarging the range and increasing the thoroughness of the artist's knowledge of forms, gives him greater resource and a broader grasp of form in general.

Modern systems of teaching drawing to children in the schools generally recognize these principles. The earliest work in the kindergarten and primary grades is such as to stimulate the imaginative and picturing faculty of the child, while he is trained by modeling and weaving into familiarity with the more elementary forms of common things. In subsequent grades the powers of accurate observation are cultivated and disciplined, while manual dexterity is imparted almost insensibly by varied exercises in drawing from leaves, flowers, and still life, and from 'flat copies' of ornament forms. In the higher grades, drawing from the cast, from the antique, and from the living model, in various media, such as charcoal, India ink, and crayon sauce, gives flexibility to the student's powers of artistic expression, and trains his taste in the selection of what to represent and what to reject in his graphic interpretation of what he sees. He is also taught a proper *method* or procedure in the making of his drawings, and learns the correct use of construction lines and block outlines, the importance of securing accuracy in the masses before attempting details, and other like principles of correct delineation. In parallel courses, usually in connection with manual training, he has also been taught the elements of mechanical drawing. All these exercises are invaluable for imparting the power of quick, comprehensive, and accurate observation, precision of eye-measurements, and dexterity of hand; endowments all of which are useful in the affairs of life, quite apart from any direct application to the fine arts. The detailed methods and sequence of the instruction vary greatly in different systems. Some dwell especially upon nature-study; others emphasize the development of form-memory; others again make large use of the forms of classic ornament to train at once the eye, the hand, and the taste. In the art schools generally the pupil begins by drawing from the flat copy, then takes up drawing from the antique, i.e. from casts of antique sculpture, and, finally, enters the life-class, in which he draws from both nude and draped living models. The criticism has been made that in too many of these schools the teaching follows the routine of apprenticeship methods, and lacks philosophical analysis and progressiveness; but this doubtless is not true of the most advanced among them. Among the more important works on drawing are: Ruskin, *Elements of Drawing* (London, 1857); Pennell, *Pen Drawing and Pen Draughting* (London, 1889); Maginniss, *Pen Drawing* (Boston, 1899); Ware, *Modern Perspective* (New York, 1895); Spiers, *Architectural Drawing* (London, 1888); also the interesting *Album de Villard de Honnecourt*, edited by Lassus (Paris, 1858); and *Cyclopedia of Drawing* (Chicago, 1905). For the teaching of drawing, consult: Clarke, "Drawing in the Public Schools," *Report of the United States Bureau of Education*, Circular of Information No. 2 (Washington, 1874); Tadd, *New Methods in Education* (New York, 1899); Hatton, *Figure Drawing and Figure Composition* (New York, 1905). For mechanical drawing consult treatises of Anthony (Boston, 1903); Bartlett (New York, 1903); Jamison (New York, 1904). See PERSPECTIVE, and LINE.

DRAWING-BOARD. A board on which drawing-paper is strained for painting in water-colors. The paper is wetted for the purpose of being strained, and, when attached at the edges, it is permitted to dry and contract. Formerly, the drawing-board was fitted into a frame, the edges of the wet paper being made fast by the pressure of the frame on the board. But the much simpler drawing-board which is now in use is made of a flat piece or pieces of wood, held together and prevented from warping by an edging of other pieces, the grain of which runs in the opposite direction. The wet paper is attached to the edges of the board with paste or thin glue, and when dry, becomes perfectly firm and flat. The same kind of board is used for charcoal or crayon drawing, in which case the paper is merely pinned to the board.

DRAW-PLATE. A steel plate with a graduated series of holes, through which metals are drawn in making them into wires or bars. See Wire.

DRAY'TON, Michael (1563-1631). An English poet. He was born in Hartshill, in Warwickshire. Of the events of his life but little is known. He was a page probably in the household of Sir Henry Goodere of Powlesworth, to whom he was indebted for his early education. In 1591 he was in London, although under James he failed in efforts to gain the royal favor. He began his literary career with a metrical rendering of parts of the Bible called *The Harmony of the Church* (1591). The volume was condemned by the authorities, and all but forty copies of the edition were destroyed. This was followed, in 1593, by nine eclogues with the title, *The Shepherd's Garland;* and in 1594 by a series of sonnets, in which was celebrated some unknown woman, under the name 'Idea.' Drayton's famous sonnet ("Since there's no help, come let us kiss and part") belongs to a later period. *England's Heroical Epistles* (1597) was a successful imitation of Ovid's *Heroides.* In 1603 appeared a long historical poem, called *The Barons' Wars,* parts of which, in another metrical form, had been published seven years before. Some of Drayton's very best work—as the *Ballad of Agincourt*—is contained in *Poems, Lyrical and Pastoral* (about 1605). For many years he had been at work on a long descriptive poem. It was published under the title *Poly-Olbion* (first installment 1613; complete, 1622). Though monotonous as a whole, it contains fine passages. Drayton opened a new vein in the fairy poem *Nimphidia,* one of a collection of poems published in 1627. This new vein was further worked in the ten *Nimphalls,* in the *Muses' Elysium* (1630). He also collaborated in several plays. Though much of his work is uninteresting, he wrote many choice poems. We have nothing more dainty than his fairies, and no finer martial ballad than his *Agincourt.* He was buried in Westminster Abbey. The Spenser Society has reprinted *Poems of 1605* (1885-87), *Poems, Lyric and Pastoral* (1891), *Poly-Olbion* (1890), and *Muses' Elysium* (1892). Consult selections from the *Poems,* by Morley (London, 1878); by Bullen, privately printed at Chilworth (1883); Elton, *Introduction to Drayton* (Manchester, 1895); id., *M. Drayton: A Critical Study* (London, 1905).

DRAYTON, William Henry (1742-79). An American Revolutionary patriot. He was born on the family estates in South Carolina; went to England in 1753, with Charles Cotesworth Pinckney and Thomas Pinckney; was educated at Westminster School and at Balliol College, Oxford; returned to South Carolina in 1764; and soon afterwards was admitted to the bar. In 1769 he wrote, under the signature 'Freeman,' a series of letters against the 'patriotic associations' of the time, which he charged with encroaching on private rights; and largely on this account he was appointed privy councilor for South Carolina in 1771, and assistant judge in 1774. In the latter year, however, he published a vigorous anti-ministerial pamphlet, entitled *Letter of a Freeman of South Carolina to the Deputies of North America, Assembled in the High Court of Congress in Philadelphia,* and for this he was promptly removed from his positions as councilor and judge. He was president of the Council of Safety and of the Provincial Congress of South Carolina in 1775; was made Chief Justice of the State in March, 1776; and, while acting in this latter capacity, in April, 1776, virtually proclaimed the independence of South Carolina on the ground that King George III., having violated American rights, had 'by the law of the land . . . abdicated the government,' and henceforth had 'no authority' in the former colony. He acted as president of the State for a short time in 1777, during the absence of John Rutledge, and from 1778 until his death was a prominent member of the Continental Congress. Besides writing a number of powerful pamphlets, he planned a history of the Revolution, on which he had made considerable progress at the time of his death. A large part of his manuscript was destroyed, however, on the ground that it contained important State secrets, but two volumes survived, covering the history of the Southern Colonies between 1773 and 1776, and these subsequently served as the basis for a work by his son, John Drayton, entitled *Memoirs of the American Revolution* (Charleston, 1821).

DREAMING (from *dream,* OS. *drōm,* Icel. *draumr,* OHG. *troum,* Ger. *Traum,* dream; probably connected ultimately with OHG. *triogan,* Ger. *trügen,* Skt. *druh,* to deceive, OPers. *drauga,* a lie). In the profoundest sleep, there is, so far as we can tell, a total lapse of mentation; the conditions of the formation of a consciousness are not realized. There has been, it is true, much dispute as to whether the mental life is ever really extinguished in sleep; and we cannot deny the possibility of a continuance of bare organic sentiency, which is lost, on waking, in the richer ideation of the normal consciousness. But, however that may be, introspection gives us no psychological warrant for the assumption of mental process during deep sleep. In the lighter stages of sleep, on the other hand, there is intermittent mentation; we 'dream,' and the dream-consciousness is, in large measure, accessible to our analysis.

It is probable that dreams, in the great majority of cases, are started by the stimulation of some sense-organ, and do not take their origin within the brain itself. We may darken our bedroom as we will, but we cannot rule out the 'intrinsic gray' or 'light dust' of the retina; nor the throbbing and buzzing of the blood-circulation in the ear; still less can we eliminate cutaneous and organic stimulations. There is, then, always the possibility of a sense-impression finding its way to the brain during sleep. If, now, we keep our eyes closed as we wake from a visual dream, we can often trace the dream-pattern in the light dust that is seen upon the field of the closed lids; while, conversely, if we note the pattern of the light dust before we fall asleep, and then have ourselves waked, we find that the dream has taken its form and character from the peripheral excitations. Here is clear evidence that the brain has received its dream-cue from the eye. Similar tests have been carried out, with similar though less striking result, upon the other sense-organs. As a general rule, then, the dream-consciousness seems to be started by some sensory stimulus, though, having once originated, it may continue its course in obedience to the laws of association (q.v.) without any further interference from the outside.

We have supported this conclusion by an appeal to the eye; and the appeal has, doubtless, appeared quite natural. For dreams are predominantly visual: so strongly visual, indeed, that it is not rare to find them defined, in so many words, as 'trains of fantastic images.' There is good reason for this preponderance of visual mind-stuff in dreams: (1) Most of us, in the waking life, are likely to think, imagine, and remember in visual terms; we are 'eye-minded.' It is evident that this ingrained habit of mind toward visualization must show itself in dreams. (2) The retina is in a constant state of intrinsic excitation during sleep: the retinal gray and the light dust will, if only the chance be given them, make themselves known in sensation. (3) And the chance must be given them fairly frequently. For sight is the first sense to disappear, as sleep comes on, and the last sense to be regained on waking: so that the eye may be stimulated, during sleep, with a moderately high degree of intensity, while the sleeper is still not disturbed. Dreams, however, are by no means exclusively visual. Next in order of frequency to dreams of sight stand, perhaps, the dreams whose principal material is organic and temperature sensations. It is curious to note that dreams which are initiated by an organic sensation (a pain, a suffocation, a cramp) are oftentimes translated into terms of vision. A slight intercostal pain may be dreamed of 'in kind' as a dagger-thrust, or the bite of a mad dog; but we shall probably see the dagger and the dog—and, in many cases, these will be the main objects of the dream, the organic sensation being present merely as a vague discomfort. So the rhythm of breathing may be 'seen' as a flight of birds or of angels; and an irritation of the skin may be 'seen' as a host of caterpillars or beetles crawling over us. This fact of translation into the language of sight has done much to divert attention from the very common occurrence of organic sensation in the dream-life. In the third (or, as some authors would say, in the second) place, come dreams of hearing. Conversation is the one form of external stimulus that, in every-day life, approaches the visual stimuli of our surroundings in regularity and insistency, and fragments of conversation are the most frequent auditory constituents of dreams. Sounds like the humming of bees and the clatter of musketry—the dream interpretations of the intrinsic noises of the ear—follow next in order. Tonal or musical dreams occur, but are rare. Finally, the senses of smell, taste, and cutaneous pressure may and do contribute elements to our dreams; but these elements are extremely liable to visual translation, and appear but rarely in pure form.

The dream-consciousness is not confined, of course, to sensations, perceptions, and ideas. Every mental formation that is found in the waking life may be represented (or simulated) in the dreaming state. Thus the presence of emotion in dreams—surprise and excitement; fear and shame; disappointment and anger; jealousy and perplexity—is a matter of experience. Indeed, the appearance of emotion follows almost as a matter of course from the large part played in dreaming by the organic sensations. (See FEELING; EMOTION.) We have, further, frequent instances of passive memory, i.e. of the recognition of persons or places—recognitions which our waking consciousness not seldom declares to be false recognitions, but which, none the less, have the true recognitive form and 'feel'; of active memory, efforts of recollection; of passive imagination, the supplementing in idea of the situation before us in (seeming) perception; of active imagination, e.g. the writing of poetry; of resolve and voluntary endeavor; and of active attention. In illustration of the latter, we may take the following dream: "I was trying to find the name of a philosophical writer, which I knew began with D. I ran through the index of the book I held in my hand, but could not find the name. Then I went to the shelf; took down another book, and ran through its index in the same way, with successful result." So far, indeed, may this reproduction or simulation go, that we sometimes dream that we are dreaming. We say, in ordinary life, "The whole thing seemed like a dream"; and the same experience of dream-likeness reoccurs in the dream-consciousness.

We have spoken of the 'reproduction or simulation' of mental formations. Our dream poetry, if it be really composed during sleep and not in the half-waking state before complete arousal, is neither rhyme nor reason; the foreign languages that we speak so fluently in dreams are unfamiliar to us in the waking life; our dream resolves are ineffective; our dream recognitions, as we have said, are oftentimes false. These observations have led to the theory that the dream-consciousness is composed, in reality, of a mere panorama of images; and that the complex mental formations which seem to occur in dreams are really imaginary. There is, however, no cause for going behind the clear verdict of introspection. The formations occur; but, owing to the extreme limitation and irregular distribution of attention in the dreaming state, they show characteristic differences from the corresponding formations of the waking life.

Here, indeed, is the crucial problem that the dream presents to psychology. The arrangement of ideas in dreaming is fantastic and disorderly; yet, as the dream comes, we accept its events and incidents unquestioned, taking everything for granted. How are we to account for these seemingly opposed facts? (1) The fantastic nature of the dream is explained by the almost unrestricted freedom of association in the dream-consciousness. Our waking consciousnesses are regulated by pressure of outside circumstances. In dreaming, as in reverie, there is a practical absence of regulation: an idea of our childhood is as likely to arise as an idea of yesterday; the sequence of ideas may be logical, but may also be determined by the most trivial and irrelevant of connecting links. As a rule, the fundamental things of mind (space-perception, personal identity) remain; but even these may undergo dissociative changes. Association is uncontrolled, and has free play. (2) On the other hand, dream ideas are intensive, and impressive. The sleeping brain is generally inexcitable; when, however, an excitation makes its way to the cortex, the result is out of all proportion to the intensity of stimulus. It is as if the active part of the brain drained the inactive part of a portion of its stored energy. Moreover, the scenes in a dream come always in single file. Consciousness has nothing of the 'thickness' and complexity, the wealth of 'fringes' and marginal elements, that it has in waking. The part of the brain stimulated is a strictly local area; the greater part of the cortex is still quiescent. Now this narrowness of consciousness means that we have no means of comparing the dream event with the data of our past experience; the event does not fall into relations, but stands alone. But an idea which is at once impressive and uncontradicted is, of course, accepted and believed. Hence is it that the dream, despite its absurdity when recounted in the normal environment of the waking life, provokes no scruples or hesitancies as we dream it.

A word may be added concerning the prophetic character ascribed to dreams, both in primitive belief and in popular superstition at the present day. While the genesis of the belief is not hard to trace—we have but to remember that a friend, known to be many miles away, may appear at our side in a dream; nay, more, that our dead friends may seem to return and converse with us—it is scarcely necessary to say that it is wholly unfounded. Our dreams reflect, to some extent, the state of our general health, and may thus be useful as warning us against overstrain; but there is no valid evidence that they give us insight into the future.

Consult: Wundt, *Human and Animal Psychology* (London, 1896); id., *Grundzüge der physiologischen Psychologie* (Leipzig, 1902-3); Delbœuf, *Questions de philosophie et de science: Le sommeil et les rêves* (Paris, 1885); Maury, *Le sommeil et les rêves* (Paris, 1865); Hammond, *Sleep and Its Derangements* (Philadelphia, 1869).

DREAM LIFE, A Fable of the Seasons. A series of sketches by Donald G. Mitchell (1851), a companion volume to his *Reveries of a Bachelor*. It is based on the seasons of the year, and consists of a number of sympathetic descriptions of human life from childhood to old age.

DREAM OF EU′GENE A′RAM, The. A poem by Hood (1829), detailing an imaginary dream narrated by Eugene Aram (q.v.), in making confession to a child of the murder of Clark.

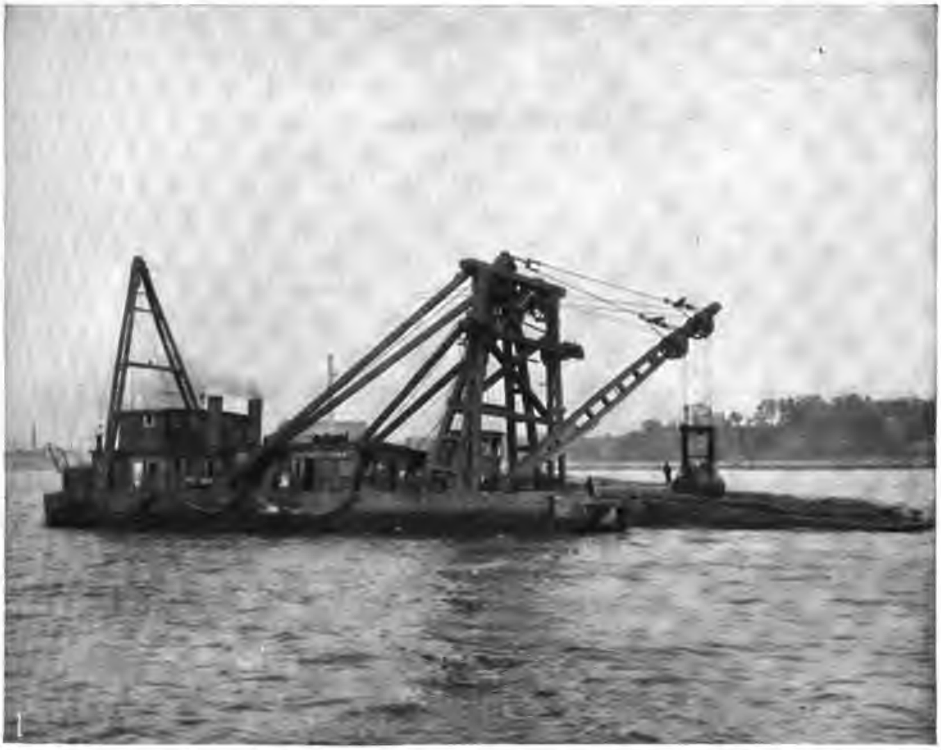
DREB′BEL, Cornelis van (1572-1634). A Dutch inventor. A peasant by birth, he won the favor of the Emperors Rudolph II. and Ferdinand II., and of King James I. of England. The last fourteen years of his life were spent in London, where his discoveries in new processes for dyeing wool and silk (afterwards used by the founders of the Gobelin manufactures) and his clever inventions, among them a compound microscope, and a machine for perpetual motion, gave him the reputation of being a sorcerer. Drebbel has left two treatises, published in Dutch (1608), in Latin (1621), and in French, under the title, *Deux traités: De la nature des éléments; De la quintessence* (1673).

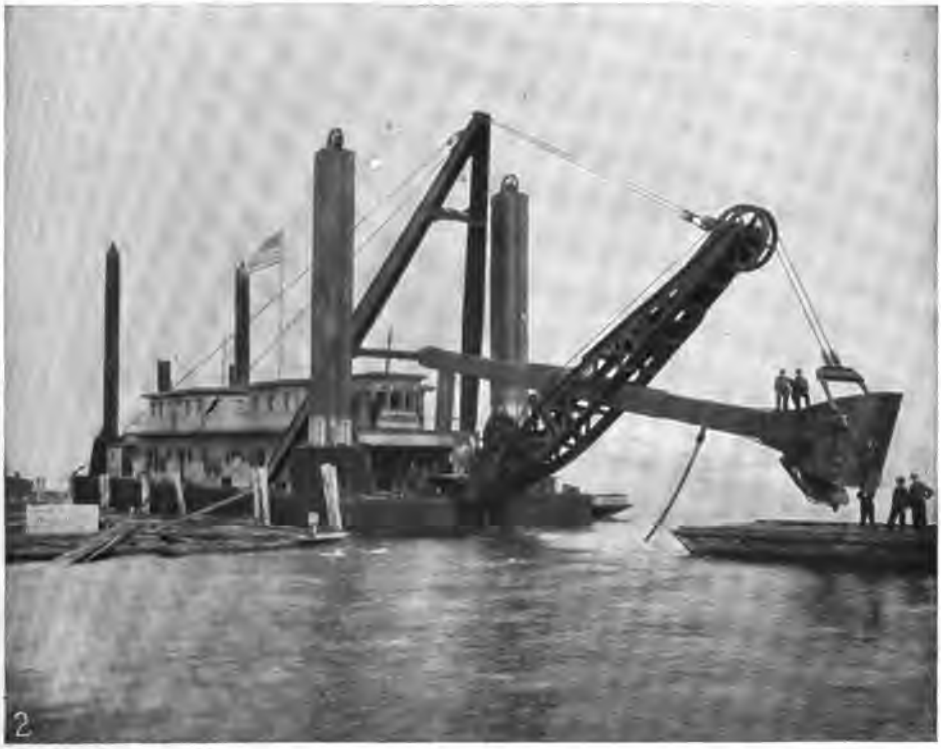
DREBER, drā′bĕr, Heinrich Franz (1822-75). A German landscape painter, born at Dresden. He studied at the Dresden Academy, and under Ludwig Lichter, and finally—as the stipendiary of the Dresden Academy—at Munich and at Rome, where he became permanently established. His paintings are distinguished by beautiful coloring and a poetic conception. He frequently introduced antique figures into his landscapes. Among his best productions are the following: "Autumn in Sabine Mountains" (National Gallery, Berlin); "Good Samaritan" (1848; Dresden Gallery); "Sappho" (Schack Gallery, Munich).

DRED. A novel by Harriet Beecher Stowe (1856), exposing the conditions of the Southern slave system. The title character is a fugitive slave. A new edition appeared, ten years later, entitled *Nina Gordon*.

DREDGE (assibilated form of *drag*, AS., Goth. *dragan*, Icel. *draga*, OHG. *tragan*, Ger. *tragen*, Engl. *draw*, *drag*). Any device for removing and bringing up solid substances or material from under water. The simplest form of dredge is that used by oyster-fishers, which consists of a strong bag or net whose mouth is kept open by a metal ring, and which is operated by hand by means of a long pole to whose end it is attached. The deep-sea dredge used by scientists for collecting samples of the sea-bottom, with its plant and animal life at great depths, is a device similar in its general construction to the oyster-dredge, but is, of course, attached to a long wire cable and operated by being dragged along the bottom until filled. (For illustration and description, see Deep-Sea Exploration.) In engineering a dredge or dredging-machine is an excavating device employed in deepening channels and harbors, removing submarine obstructions, such as shoals and bars, and for general excavating operations under water. Dredges may be divided into several classes, the principal of which are dipper dredges, endless-chain bucket dredges, grapple dredges, and hydraulic-suction dredges.

The Dipper Dredge is similar in its construction to the ordinary steam shovel, except that the platform carrying the machinery consists of a barge instead of a car. In the ordinary dipper dredging-machines a mast or A-frame is mounted on the front end of the barge, and serves to support the top end of an inclined boom whose bottom end is pivoted to a suitable casting on the deck of the barge, so that it can swing partially around like the boom of a derrick. Between the two parallel timbers of this boom is inserted a long timber carrying at its outer end a dipper or scoop open at the top and closed by a door at the bottom. By means of suitable mechanism this dipper is thrust down to the bottom and given a scooping motion which fills the dipper; the next operation is to raise the dipper, and by swinging the boom to one side bring it over an attending barge, when the latch holding the bottom door is unlocked and the contents of the dipper are discharged into the barge. By successive repetition of these operations the bottom is excavated to such a depth as may be desired. To resist the digging thrust of the dipper, the scow is provided with vertical





1. **OSGOOD CLAM SHELL DREDGE.** This dredge has a bucket of ten cubic yards capacity, and digs to a depth of 80 feet.

2. **OSGOOD DIPPER DREDGE.** The dipper carries 15 cubic yards of material, and works in depths up to 50 feet.

timbers or spuds, which can be thrust down into the bottom and so prevent the barge from moving. Dipper dredges are more extensively used in America than in European countries. One of the largest dipper dredges ever built was the *Pan-American*, constructed in 1899 for work on the Great Lakes. The hull of this dredge was built of white oak and Oregon fir, and is 136 feet long, 42 feet 3 inches beam, and 13 feet 6 inches deep. There are four spuds—two at the bow, each 4 × 4 feet square and 50 feet long, and two at the stern, each 2 × 2 feet square and 50 feet long. These spuds are raised and lowered by power. The A-frame and boom are of steel; the A-frame is 53 feet high and the boom is 53 feet long and weighs 30 tons. The dipper-handle is of wood, reinforced by steel plates, and carries a dipper holding 8¼ cubic yards and weighing 16 tons. The dredge was guaranteed by the builders to take a dipper-load from the bottom at a depth of 25 feet every 40 seconds.

Another form of dredge, known as the *grapple dredge*, is constructed much like the dipper dredge in respect to the barge, A-frame, and boom; but instead of a dipper the excavating device proper is a grapple which is so suspended from the end of the boom that it can be lowered to the bottom and raised with its load. One of the most common forms of grapple is the clam-shell, which consists of two parts hinged together much like the two parts of a clam-shell. The mechanism which raises and lowers the grapple also serves to open and close its jaws. In operation, the grapple, with its jaws open, is lowered to the bottom, into which its weight causes it to sink partly; the jaws are then closed, and thus grasp a quantity of material, which is raised and discharged into a scow by opening the jaws again. When the material to be excavated is hard, the grapple is provided with teeth, and when so equipped it can be used to excavate loose rock. Sometimes the grapple consists of several sectors of a sphere, when it is called an orange-peel bucket. One of the largest grapple dredges ever built was designed for use in constructing the Buffalo (N. Y.) breakwater. (See Breakwaters.) The hull was of wood, 120 feet long, 40-foot beam, and 12½ feet deep, with a false bow and stern to make it tow more easily, which increased the total length to 160 feet. The A-frame is 50 feet high, and the boom is 65 feet long. The bucket is of the clam-shell type, with a capacity of 10 cubic yards and weighing 15 tons. At Buffalo, N. Y., this dredge worked in water 65 feet deep, and loaded 10 or 11 scows of 400 cubic yards capacity in 10 hours.

The Continuous-Chain Bucket Dredge consists of a hull for the support of the excavating machinery much like the hull of the dipper or grapple dredge; but the excavating mechanism is essentially different. An elevated structure on the hull carries a long girder whose top end is hinged horizontally to the top of the framework, and whose other end extends down through a well-hole in the hull to the bottom of the water. There is a sprocket wheel at each end of this girder, over which a flexible endless chain is made to run by power applied to the upper sprocket wheel. At intervals along this chain are attached scoop buckets, which of course travel with the chain. As each bucket reaches the bottom of the girder, which is in contact with the bottom of the channel being excavated, it scoops up a portion of the material and carries it to the top of the girder, where the load is discharged as the bucket passes over the upper sprocket wheel. The buckets discharge into chutes leading to scows moored alongside, or to hoppers in the dredge itself. Sometimes the girder, with its chain of buckets, is arranged to pass over one or both sides of the dredge-hull, instead of through an inside well. A continuous-chain dredge of 1250 horse-power capacity was built at Glasgow during 1905 for harbor improvements in England. This dredge has a hull 207 feet long, 42 feet beam, and 14 feet deep. The hull is of steel, as is also the frame-work carrying the girder. The girder consists of two parallel plate girders braced together by transverse struts. The dredge has a capacity of 1000 tons per hour and can work to a depth of 56 feet. The buckets themselves have a capacity of 21 cubit feet each, and are made of plate and cast steel, with hardened steel cutting edges. This dredge is provided with propelling mechanism by means of which it can be navigated from port to port.

Suction Dredges are extensively used where the material to be excavated is mud, sand, or other soft matter which can be mixed with water and pumped through pipes. The excavating machinery consists of a suction pipe which can be lowered through a well or over the side or end of the hull, a centrifugal pump for sucking or drawing a stream of water through this suction pipe, and a discharge pipe through which the pump discharges the water thus sucked in. In operation the end of the suction pipe is lowered to the soft bottom, and partly buries its end in the material. The pump is then started, and sucks a stream of water and mud through the suction pipe and discharges it into the discharge pipe. In most dredges of this type the end of the suction pipe is provided with revolving cutters or with water jets to loosen the material, so that it will be more easily drawn into the suction pipe. The discharge pipe may lead to hoppers in the dredge, or it may be extended to the shore and discharge at some point where land is to be filled in or where the waste material will do no injury. The two suction dredges built during 1900 for removing the 40,000,000 cubic yards of sand and mud in the East Channel improvement of New York Harbor are among the most perfect suction dredges of the hopper type ever built. These dredges have hulls 300 feet long, with a beam of 52½ feet and a depth of 25 feet. The hoppers on each dredge have a capacity of 2800 cubic yards, and occupy a space of 125 feet amidships on each side of the hull. Between the two rows of hoppers is the well for the suction pipe. Water jets are used to loosen the material. The centrifugal pump has a capacity of 75,000 gallons of water per minute. The dredge is provided with its own propelling machinery. The four types of dredges which have been briefly described are often modified in their construction and arrangement for special uses, and the features of one type are often combined with the features of another type to form a combination machine. The best descriptions of dredges are to be found in the various engineering society periodicals and the engineering papers of Europe and America.

DREDGING, DEEP-SEA. See DEEP-SEA EXPLORATION.

DRED SCOTT CASE. One of the most important cases ever decided by the Supreme Court of the United States. It came up from the lower court on an agreed statement of fact. One Dred Scott, a slave owned by Dr. Emerson, of the regular army, a resident of Missouri, had in 1834 been taken by his owner into Illinois, a Commonwealth where slavery was prohibited, and had later (1836) been taken into what is now Minnesota—a part of the Louisiana Purchase, in which slavery was expressly prohibited by the Missouri Compromise of 1820 (q.v.). While on free territory (1836), Scott had been allowed to marry, his wife being a slave, also owned by Dr. Emerson; and, later—in 1838—with his wife and a child born to them on free soil, he was taken back into Missouri. In 1848 he resolved to sue for his freedom, and in this purpose he was gratuitously aided by prominent lawyers of free-soil beliefs. The chief ground of his contention was that, through his residence in territory where slavery was prohibited, he had lost his status as a slave, and acquired that of a freeman. The Supreme Court of Missouri, however, held (1852) that upon being brought back into territory where slavery was legal, the status of slavery reattached to him, and that he had no standing before the court. As involving a question under the Federal laws and Constitution, the case was brought in 1854 before the Federal Circuit Court, which held that Scott was a citizen of Missouri, and could be a party in a suit before a Federal court, but decided the case against him. The case was then taken on appeal to the Supreme Court of the United States, where the chief legal question was as to the correctness of the lower court's decision that the Federal court might take jurisdiction of a case brought by a person of such a status as was that of Scott. The case was argued at length in 1855 and 1856, and the decision was not finally handed down until March, 1857. The Supreme Court held (Curtis and McLean dissenting) that the Circuit Court had erred in entertaining the suit, because Scott was not a citizen, and therefore was not entitled to any standing in the courts; that at the time of the formation of the Constitution, negroes descended from negro slaves were not, and could not be, citizens in any of the States; and that there was no power in the existing form of government to make citizens of such persons. This point was so decided by a majority of the court. In the course of his decision, Judge Taney used the following language: "It is difficult, at this day, to realize the state of public opinion in relation to that unfortunate race which prevailed in the civilized and enlightened portions of the world at the time of the Declaration of Independence, and when the Constitution was framed and adopted. But the public history of every European nation displays it in a manner too plain to be mistaken. They had for more than a century before been regarded as beings of an inferior order, and altogether unfit to associate with the white race, either in social or political relations; and so far inferior that they had no rights which the white man was bound to respect, and that the negro might justly and lawfully be reduced to slavery for his benefit. He was bought and sold, and treated as an ordinary article of merchandise and traffic, whenever a profit could be made by it. The opinion was at that time fixed and universal in the civilized portion of the white race." The single sentence, "no rights which the white man was bound to respect," has often been quoted apart from its connection, though it was designed merely as a statement of opinions prevalent when the Constitution was adopted. A dissenting opinion, however, was read by Mr. Justice Curtis, showing the error of Chief Justice Taney's historical argument against the possibility of such persons attaining citizenship, and forcibly contending that as nothing had been shown except that Scott was a negro and was descended from negroes who had been slaves, his claim to citizenship had not been seriously controverted. Not content with deciding the only question of law involved, the Chief Justice, in an *obiter dictum* which has become historic, went further, and undertook the discussion of matters generally considered foreign to the case and not necessarily involved in the decision of the lower court. Taking up the subject, at that time of vital importance, of the power of Congress over the Territories, the majority of the court held that the Missouri Compromise was unconstitutional; that the power of Congress to govern the Territories was subordinate to its obligation to protect private rights in property; that slaves were property, and, as such, were protected by the constitutional guarantees; that Congress had no power to prohibit a citizen of any State from carrying into any Territory slaves or any other property; and that Congress had no power to impair the constitutional protection of such property while thus held in a Territory. By this dictum (from which Curtis and McLean wholly, and Catron partially, dissented) one of the extreme doctrines of the pro-slavery party was affirmed as correct, and even the dogma of 'popular sovereignty' was discountenanced. The decision, coming immediately after the inauguration of Buchanan, aroused intense feeling, made still more clear the issues which were to be decided in the impending crisis, and impressed upon the North the seriousness of the task of the party of freedom, when opposed both by the executive and by the judicial departments of the National Government. The full text of the decision is in vol. xix. of Howard's *United States Reports*. Consult also Tyler, *Life of R. B. Taney* (Baltimore, 1872); and G. T. Curtis, *Memoirs and Writings of Benjamin R. Curtis* (Boston, 1880).

DREIBUND, drī'bo͞ont. See TRIPLE ALLIANCE.

DREIS'SENA (Neo-Lat., from *Dreyssen*, a Belgian naturalist). A genus of small lamellibranchiate mollusks, allied to the mussels. *Dreissena polymorpha* is interesting, because, having been accidentally introduced from its native home, about the Caspian Sea, into western Europe, it has fully established itself, and has invaded water-pipes in many districts of Great Britain, becoming a nuisance. It is capable of living a long time out of water with its valves closed, and may have come to Great Britain on timber imported from the Continent.

DRELINCOURT, drâ-lăN'ko͞or', CHARLES (1595-1669). A French Protestant theologian.

In 1620 he went to Paris, and was made minister of the church at Charenton. Among the best known of his writings, many of which have been translated into different languages, are: *De la persévérance des saints* (1625); *Du jubilé des églises réformées avec le jubilé de l'église romaine* (1627); and *Consolations de l'âme fidèle contre les frayeurs de la mort* (1651). This latter essay received the praise of Defoe in his *Apparition of Mrs. Veal.*

DREN'TELN, Alexander Romanovitch (1820-88). A Russian soldier, born in Kiev. He entered the army in 1838, in 1867 became adjutant-general, and in 1877, at the outbreak of the Russo-Turkish War, was appointed to the command of the reserves in Rumania. From 1878 to 1880 he was director of the third section of the Imperial Chancellery, in which capacity he controlled that portion of the Russian police which had to do with political offenses. An attempt upon his life was made by a Nihilist in 1879. In 1880 he was appointed a member of the Imperial Council and Governor-General of Odessa.

DRESDEN, drĕz'den. A town of Kent County, Ontario, Canada, at the head of navigation on the Sydenham River (Map: Ontario, A 5). It is on the Erie and Huron division of the Pere Marquette Railroad, and has flax, lumber, and canning industries. Population, in 1891, 2058; in 1901, 1613.

DRESDEN, drĕz'den, *Ger. pron.* drās'den. The capital of the Kingdom of Saxony, situated on both banks of the Elbe, in latitude 51° 3′ 3″ N. and longitude 13° 44′ E. (Map: Germany, E 3). The Elbe separates the Altstadt and Friedrichstadt and their eight suburbs on the left bank from the Neustadt and Antonstadt with their suburbs on the right bank. The river is crossed by five bridges (one of iron and four of stone), of which the Augustus Bridge dates from the twelfth and thirteenth centuries. Dresden has numerous squares and parks, both in the old and the new parts. Its largest park, the Grosse Garten, is situated in the Altstadt, and contains, besides numerous statues, a museum of antiquities and a zoölogical and a botanical garden. The most noteworthy of the squares of the Altstadt are the Altmarkt, the Neumarkt with its Luther Memorial, the Theater-Platz with the statue of King John, by Schilling, and the Schloss-Platz. Across the Elbe the principal squares are the Albert, the Kaiser Wilhelm, and the Alaun. Along the left bank of the Elbe lies the Brühl Terrace, the finest promenade of the city. It is about half a mile long, with a beautiful staircase decorated with gilded statuary. The churches of Dresden are numerous, but none of them are of great interest. The Church of Our Lady on the Neumarkt, dating from the beginning of the eighteenth century, has a lofty 'lantern,' and contains a fine baroque altar. Near the Augustus Bridge is the Roman Catholic Court Church, erected in the middle of the eighteenth century in the baroque style. It is surmounted by a tower 280 feet high, and its façade is adorned with 78 statues of saints by Mattielli. The Protestant Sophienkirche was built in the thirteenth and fourteenth centuries, and was restored in 1864-68.

Among the secular buildings, the most prominent is the royal palace, begun in 1534, and considerably enlarged and adorned by Augustus the Strong. It is partly built in the style of the seventeenth century, and has a tower 331 feet high. Its great court contains several noteworthy winding staircase towers. The banquet and throne halls are decorated with mural frescoes by Bendemann. The Zwinger is the vestibule of an extensive and magnificent palace begun during the reign of Augustus the Strong by the Court architect, Pöppelmann, and never completed. The Zwinger comprises seven pavilions connected by a gallery, with an oblong court in the centre. It is built in the baroque and rococo styles. Its northeast wing forms the Museum, a very fine building in the Renaissance, begun in 1846 and completed in 1855. It is profusely decorated with sculptures, including statues of Michelangelo, Giotto, Holbein, Dürer, and Goethe. Among other public buildings are the Prinzen-Palais, erected in 1715, the Brühl Palace, and the Hof Theater, a beautiful Renaissance edifice completed in 1878. The new post-office, the Academy of Medicine and Surgery, the Rathaus, and the court-house are also noteworthy. Among the public buildings of the Neustadt, the most interesting is the Japanese Palace, dating from 1715, and now containing the Royal Library.

Among the educational institutions of Dresden are the Royal Technical High School, with several faculties, a number of classical and 'real' gymnasia, and several art and denominational schools. The Royal Music School is one of the most celebrated institutions of its kind. Dresden has three municipal theatres, of which the famous Court Theatre is devoted to opera and important dramas, and is one of the leading theatres in the world. In art collections and libraries Dresden ranks high. As early as the sixteenth century the Saxon princes began to accumulate works of art, and laid the foundations of the splendid galleries and museums for which Dresden is famous. The Royal Library was founded by the Elector Augustus in the sixteenth century. It contains about 475,000 volumes, a large number of MSS. and maps, and a collection of portraits. The Museum Johanneum possesses a rare collection of Chinese, Japanese, Indian, and Dresden porcelain, numbering about 15,000 pieces.

The Dresden Picture Gallery, for which the city is best known, is located in the museum of the Zwinger, and contains upward of 2500 canvases. The collection is especially rich in Italian and Dutch works. Among the numerous Italian masters represented are, first of all, Raphael with his most celebrated picture, "The Sistine Madonna"; Andrea del Sarto; Correggio ("Holy Night"); Titian ("The Tribute Money"); Palma Vecchio ("Venus and the Graces"). Paolo Veronese, Tintoretto, Caravaggio ("The Card Sharper"), and Ribera are also to be seen here to advantage. Of the Spanish school, Velasquez and Murillo are represented by one fine picture each. Masterpieces of the Flemish school are especially numerous, including the "Boar Hunt" and other famous canvases by Rubens, admirable portraits by Van Dyck, and a number of pictures by Jordaens and Teniers the Elder. Among the Dutch masters are Rembrandt (portraits of himself and his wife, and "Manoah's Sacrifice"), Frans Hals, G. Dou, Adriaen van Ostade, Ruysdael, Paul Potter, Van der Meer, Terburg, and Metzu. The French schools of the seventeenth and eighteenth centuries are represented by landscapes of Claude Lorrain and examples of Poussin and Watteau. Of the German school, Holbein and Dürer are the conspicuous figures. Besides the picture gallery, the museum contains over 350,000 wood-cuts and copper engravings. Among other collections in Dresden may be mentioned that of the precious stones, jewels, etc., in the famous Green Vault of the royal palace. There is also the collection of ancient and modern arms, implements, and costumes in the Museum Johanneum, one of the completest historical museums in Germany.

Dresden is administered by a chief burgomaster, two burgomasters, thirty-three aldermen, seventeen assessors and referendaries, and a council of 72 members. The municipality owns and manages its water-works, gas plant, and an electric plant, as well as the abattoirs. The cleaning of the streets is done entirely by the municipality at an annual cost of about $150,000, and Dresden is considered one of the tidiest cities in Germany. The total annual expenditures of the city exceed 27,000,000 marks ($6,426,000), of which nearly one-fifth is spent on education. The municipal debt amounted in 1901, to 65,700,000 marks ($15,637,000), and the assets to 113,800,000 marks ($27,084,000). The Dresden Bank is a very large and important institution.

The manufacturing industries and commerce of the city are of considerable importance. Noteworthy products are machinery, pianos, gold and silver articles, paper, and porcelain. The publication of books and the production of art objects of various kinds are very extensive. Dresden is the seat of consular representatives from numerous countries, including the United States. The commerce is considerable, mostly by rail. The completion of its fine harbor will undoubtedly give a stimulus to water transportation. In 1834 the population was 73,614; in 1852, 104,500; in 1880, 220,818; in 1890, by the annexation of Strehlen and Striesen, it increased to 289,844. In 1895 further annexation of suburbs raised the figure to 354,285, in 1900 the total reached 359,349, and in 1905, 516,996. The climate of Dresden is marked by frequent and sudden changes. The suburbs along the picturesque Elbe as far as Pillnitz are very attractive, with their castles, beautiful villas, and interesting associations in connection with the lives of famous Germans.

History. Dresden is of Slavic origin. It was first called a city in 1216. At the end of the thirteenth century it became the residence of the margraves of Meissen, but did not begin to grow before the end of the fifteenth century, when it passed to the Albertine line. Its fortifications were begun in the sixteenth century. Many considerable and attractive improvements were made by John George II., including the Grosse Garten, and under the rule of Augustus II. and III. (1694-1763) Dresden became one of the finest cities of Europe. The old part was ruined by the fire of 1685, and was rebuilt as the Neustadt by Augustus I. in 1732. The Seven Years' War put an end to the growth of the city, and the bombardment of 1760 by the Prussians destroyed many of its buildings. During the Napoleonic wars Dresden suffered considerably. In 1813 it was converted by Napoleon into a great arsenal, and here he won his last victory on German soil. (See Dresden, Battle of.) In 1817 the fortifications were demolished to give way to promenades. With the opening of the Elbe to navigation, and the construction of railways, the city began to grow in economic importance, and its progress was only slightly retarded by the political upheavals of 1848-49. In 1866 Dresden was taken by the Prussians, who held it until the end of 1867. Consult: Lindau, *Geschichte der königlichen Haupt- und Residenzstadt Dresden* (Dresden, 1884-85); Gsell-Fels, *Dresden und Umgebung* (Munich, 1896); Sendig, *Dresden, eine Fremdenstadt* (Dresden, 1898); Schumann, *Führer durch die Architektur Dresdens* (ib., 1899); Gurlitt, *Die Kunstdenkmäler Dresdens* (ib., 1900); *Statistiches Jahrbuch für die Stadt Dresden* (Dresden, 1899 et seq.).

DRESDEN, BATTLE OF. A battle fought, August 26-27, 1813, between the French, under Napoleon, and an allied army of Austrians, Russians, and Prussians, under the command of Prince Schwarzenberg. On August 21 the Allies had begun the invasion of Saxony from Bohemia, and on the 25th they appeared, 150,000 strong, before Dresden, which was defended by Saint Cyr, with 20,000 French troops. Napoleon had left the city on the 17th, to go to the support of Ney, who was operating against the army of Silesia under Blücher. On receiving news that the Allies were preparing to attack Dresden, he immediately returned by forced marches, but on the 25th he was still fifteen miles from the capital, and had it not been for a fatal delay on the part of Prince Schwarzenberg, the city might have been taken before the Emperor's arrival. As it was, the assault was not delivered until seven o'clock on the morning of the 26th. The French were intrenched in the Altstadt, on the southern bank of the Elbe, and had command of the bridge across the river. The line of the Allies extended in a huge crescent to the east and south of the city, with the Russians on the right wing, the Prussians in the centre, and the Austrians on the left. In the first attack the Allies were successful along the entire line, in spite of the desperate resistance of the French. The Russians stormed one of the fortifications to the east of the city, the Prussians gained possession of the greater part of the Royal Park to the south, while the Austrians carried the suburbs to the southwest. It seemed, early in the morning of the 26th, that Saint Cyr would be compelled to capitulate. At noon, however, the Russian and Prussian advance was checked by order of the commander-in-chief, in expectation, probably, of a reinforcement of 50,000 men under Klenau, and the attack was not resumed until four o'clock in the afternoon. About noon French troops began pouring into the city from across the Elbe. Napoleon had arrived; and when the Allies resumed the assault the French had 100,000 men to oppose them. The effect was felt at once. The Russians on the right were driven from their positions, and in the centre the Prussians lost part of the ground they had gained in the morning. The Austrians on the left were also checked. Night and rain brought a stop to the fighting. Napoleon, meanwhile, had determined to deliver an attack on both wings of the allied army simultaneously, and then, by converging on the Prussian position, to crush the enemy's centre. The battle was resumed at six o'clock in the morning. On the right wing of the Allies the divisions of Ney and Mortier drove the Russians from the heights to the south of the city. The victory, however, was gained on the French right. There, while Victor was assaulting the Austrians, Mu-rat, with 20,000 cavalry, swept around their left flank and took them in the rear, crushing out all resistance and taking more than 13,000 prisoners. The Prussians in the centre were prevented from going to the support of either wing by a furious cannonade and repeated charges of the Old and the New Guard. At four o'clock in the afternoon the Allies began the retreat into Bohemia. The loss on either side in killed and wounded was about 7000 or 8000, but more than 20,000 prisoners fell into the hands of the French.

DRESS (OF. *dresser, drescer, drecier*, It. *drizzare*, to arrange, dress, from Lat. *directus*, p.p. of *dirigere*, to direct, from *di-*, apart + *regere*, to guide). The covering which men and women use for protection against heat or cold, and for the conventional need of hiding parts of the body, or the whole of it except the head and hands. Custom, in this regard, has changed continually during the historic epoch in the force and in the amount of its general acceptance. It is proposed to treat here only the practical or hygienic, the economical, and, in a way, the social side of the question, leaving for the article COSTUME all questions of the decorative effect deliberately sought, or more unconsciously obtained, by wearing apparel and ornaments of the person.

The effect of climate upon the clothing of mankind is not as immediate as would seem expedient or even necessary. The people of southern Australia had scarcely invented clothing when the whites first explored their country, their only garment being the rain-cloak of leaves thrown over the shoulders. The Patagonians, even until recent times, have gone entirely naked, using loin-cloths as their only habitual wear, and heavy covering only for defense against wind or rain or snow. The Indians of Colorado were absolutely unclothed as late as 1825. Those of the colder parts of North America wore somewhat elaborate garments for occasions of ceremony, but started for the hunt or on the war-path naked, save for the slight loin-cloth and moccasins of deer-skin. The same customs held among the non-settled Indians even at the close of the nineteenth century. Winter and summer seem to have been alike to the redskins, from Hudson's Bay to the Gulf of Mexico, except as to the hours of complete repose, and the seat by the camp-fire or in the communal lodge; but there is one modification of this statement: the almost nude figure was enveloped in a blanket, which was thrown off when there was need of activity.

It is very curious to note how sudden is the change when we go still farther north. The people of the ice are clothed in a way as deliberately complete as people of European civilization could be; defended against frost by heavy and complete garments of fur-bearing skins. It would seem that the 'land of the sunless winter' could not have been inhabited until the arts of man were so far developed that skins could be cut out to pattern and sewn together strongly; obviously a very advanced stage of early civilization. This is true even if the regions north of what is now the limit of tree-growth were inhabited before the time of extreme cold. Seal-skin, reindeer-hide, bear-skin, are all used, dressed with the hair on, and bird-skins dressed with the feathers. Waterproof garments are made of the intestines of different animals. Both sexes wear trousers, or leg-pieces made separate, and put on separately, and a shirt worn over the trousers, boots or stockings, and a hood. All these garments are of fur, and they may be doubled or tripled. These heavy skin garments are worn without underclothes, or garments of cotton or wool. When an Eskimo stoops, the shirt may be drawn away from the waistband of the trousers, leaving the naked skin exposed, even in the extreme cold of winter. This separation between the heavy garments was meant for the readier drying of that perspiration which active movement in the heavy garments would cause to start.

It is noticeable that the Eskimos use but little covering when in the snow-built winter hut, warmed by the lamp burning perpetually when seal-oil is plenty. The men are naked and the women wear but a slight covering. There is an inevitable comparison, here, with the traditional custom of the Japanese, who, with the most elaborate and over-refined social organization, highly developed arts of convenience and luxury, and especially cheap and beautiful textile fabrics, have never developed any artificial sense of the need of clothes for 'decency.' The whole family, young and old, bathe together in one or several tubs; the porters are naked except for the slightest loin-cloth, and the women who do porters' work are hardly more clothed, and bathe and dress in the open without sense of immodesty. Nor does it appear that this is the result of steadily warm weather, or that the customs in this respect change much, from Kagoshima, in the latitude and general climatic conditions of Savannah, to the northernmost island of Yezo, in the latitude of Boston. In the lives of people in warmer climates a new condition assumes great importance. This is the question of personal cleanliness and the protection of the body, once cleansed, from the too rapid action of that which might soil it. The brown people of the Pacific islands bathe, anoint themselves with cocoanut oil, and use coverings, formerly made of bark cloth, tappa, or masi, chiefly to protect themselves from the undue heat of the sun, or from rough contact with objects of nature. In like manner, the Greeks of all historic times seem to have used the bath constantly and to have anointed the body with olive oil; and the garments of the Greeks, whether the earliest peplos, open down one side and showing body, thigh, and leg at every movement, or the more closed chiton and himation of later times, are to be considered rather as a means of protecting the body against disfigurement, temporary or permanent, than for any other purpose. It is noticeable that in very cold countries no such habits of personal cleanliness seem ever to prevail, except under a very highly artificial state of society. Mowgli may bathe daily in the deep rivers of the Indian jungle, but the wolf-boys of the North German legends have no such habits as that.

This brings us immediately to the consideration of underclothing, which is almost wholly a thing of modern concern. The chiton of the Greeks, the skirt of the Egyptians worn by either sex, the blanket-like wraps of the early inhabitants of America and of New Zealand, and the enveloping wraps of cotton or similar stuff of the Malays of Java and Sumatra, although serving as an aid to personal cleanliness, are the outer as well as the inner garment. But one garment is worn, or but two in all, one of which covers such parts of the body as are not covered by the other, with of course frequent occurrence of laps or double coverings for certain parts. The description of the longer and the shorter chiton of the Greeks and of the other garments which are combined with it in our pictorial and plastic representations is given under the heading COSTUME. Among the Romans also the exact service expected of the tunica remains somewhat uncertain, because in the dress of the wealthier and more powerful classes it is the toga only that is in question, and we know of the tunica mainly, if not altogether, as the one upper garment of slaves, or as worn under the armor of the soldiers. Nothing has come down to us as to the use of underclothing in the modern sense, even by the Romans of the most luxurious times of the Empire. The use of drawers, at least occasionally, is suspected, but this suspicion is founded only upon the cases of contorted bodies of victims of the eruption of Vesuvius, A.D. 79. The use of drawers or trousers, in the more usual sense, that is to say, of leg-coverings (*fasciæ crurales*), which were acknowledged as a part of the dress and were visible, was certainly known to the Romans of the later Empire, who took it from the people of western Asia on the one hand, and from the Gauls on the other; but it was for them rather the adoption of a foreign dress, when a man was in foreign parts, than an addition to their own traditional costume.

We have to consider the Roman of position, except in the earliest days, as wearing a tunica which it was assumed would about reach to the knees, but which, judging by the few ancient representations which we have of it, was much fuller in the skirt than the Greek chiton or the modern shirt worn by either sex. Over this he wore the toga. With this exception his only garment was a protection for the foot in the form of sandal or shoe. The number of *togati* was, however, so very small, as compared with the vast number of slaves and freedmen employed in out-of-door tasks, who had no right whatever to wear the toga, that the streets of any great city of the Empire must have seemed to be full of men wearing very short gowns girded around the waist and reaching to the knees, with rough shoes to protect the feet, and no other garment whatever; while the women, much fewer in numbers, would appear much as the brown women of the West India Islands do to-day, in a single long gown fastened at neck and wrists, and with low-heeled shoes. What dress the poorer people of Italy and of Greece wore in times of great cold, when the body actually needed to have its vital heat maintained by warm clothes, is not now ascertainable.

As long as the Roman Empire influenced strongly the life of the people of Gaul and Britain, these more northern communities thought baths, taken daily and with great preparation and at leisure, the most precious of luxuries. The loss of the Roman dominion, the breaking up of the people into small societies, the comparative poverty and disorder of the whole country, and the influence and example of the monastic orders, all tended to do away with the ancient habits of personal cleanliness. It has been pointed out very often that the first adoption of those undergarments which to the modern world are essential is in the main contemporaneous with this abandonment of the ancient habits of bathing the person. Nothing of the nature of stockings was known to the ancients. They covered their feet only as a protection against extreme cold; or, if a legging was worn, it was the high military buskin, for the express purpose of protecting the foot against injury. In like manner, the general use of the shirt as a garment worn next the skin to protect it from the woolen or leather outer garment begins with the fifth or sixth century. From that time these two articles of clothing are universally considered as essential throughout central and western Europe, although frequently exceptions occur. Even in the nineteenth century, English peasants are known to have worn stockings without feet—in other words, mere leggings—and the shirt might often disappear in the case of a man wearing a garment buttoning close around the body. Sir Walter Scott describes the dress of the men of the far western islands of Scotland in the seventeenth century as consisting of a single closely fitting garment covering trunk, arms, and thighs; in other words, strongly resembling those of our modern bathing-dresses for men which are made in one piece. The gradual adoption by the people of elegant life in the great cities of the fashion which involved the bringing into sight of a part of the shirt made this garment more an obvious necessity than it had been. This began in the sixteenth century, and from that time this one undergarment has been common in Europe. Cotton or linen coverings for the legs were, however, much later to come into use, and very much less universal. As late as 1880 the most fashionable tailor in a large city of the south of France told the writer that few of his customers wore drawers of any kind, and in answer to inquiries made in consequence of this statement in the north and centre of Italy a similar condition was admitted to exist along the shores of the Mediterranean, even among persons of means. The dress of the poorer people, even the tradesmen and mechanics of the cities, continued throughout the nineteenth century as far removed from the ideal care of the body by ablutions, and by washable underclothes frequently changed, as had been the case among the wealthy and elegant during the seventeenth and eighteenth centuries. For that period, passages in many novels and essays of the time, including two or three well-known passages in Pepys's *Diary*, might be cited. In short, the conscious state of cleanliness into which a small minority of the people of European descent have brought themselves, during the years beginning with 1830 or 1840, is in a way a revival of customs which had been almost forgotten since the Mediterranean lands were the centre of civilization.

The outer garments of men and women can hardly be treated except in connection with those questions of artistic effect and elegant fashion which are treated under COSTUME. It may be noted, however, that there is always a disposition to clothe those persons who are going about active duties in such a way as not to hamper the movement of the legs. Among the ancients and in modern Japan, as of course in the semi-tropical and tropical lands, this is obtained by simply leaving the legs uncovered; but the extraordinary resort to this same expedient in lands as cold and damp as mediæval Ireland and the Highlands of Scotland since the sixteenth century is difficult to explain. The accounts we have of the Irish at the time of the first English conquest and later constantly recur to the mention of unclothed legs, even among the princes of the land. As for the kilted Highlanders, there is little doubt that the plaited petticoat worn as the one garment from the waist down is of very recent introduction. It is the successor of that part of the belted plaid which was arranged as a skirt, confined above by the belt and allowed to hang at a greater or less length, as required. One is reminded of the dress of Hindu and Javanese women—a large piece of stuff neither cut out nor sewed up, but simply adjusted around the body. Of this nature was the belted plaid—a woolen blanket held with brooches and a belt in any one of several dispositions. But at a time generally fixed as the sixteenth century it was divided, for military reasons; the plaid was made smaller and worn over the upper part of the body, partly concealing the shirt, while the philibeg or skirt was put on separately. The change, however, made no difference in the nakedness of the thighs and lower part of the body, which remained under either condition covered only by a loose floating piece of woolen, while the legs below the knees were covered with stockings of some kind; perhaps always cut out of cloth and sewn up, as in modern Highland military costume.

With these exceptions, the progress of dress in Europe and the Europeanized lands in other continents has been toward greater and still greater complexity. The attempt to leave the lower limbs of hard-working people in freedom has resulted in a series of experiments in knee-breeches, pantaloons, trousers, and the like; but in a way hard to explain the lower garments have grown generally less and less convenient and less and less comely. The human body lends itself very badly to dress, except that of the simplest robe held at the neck and draped at the waist. Everything else has to be adjusted to it with great care and constant changes and shiftings; and that the light and easily managed short breeches should have been superseded by the clumsiest of all garments, the modern trousers of stiff cloth, is inexplicable. On the other hand, the dress of women has been a constant hindrance to activity, and here again there is a disposition not to increase the ease of the body by diminishing the number and weight of complicated clothes, but to add to the difficulty and to the danger of modern apparel by separating women's garments at the waist, compelling the body to carry a dragging weight of skirts, which our increasing fondness for warmth makes yearly heavier. The complete covering dress of women in its simplest form, as we see it in Italian works of art of the fifteenth century, although lending itself less to bodily activity than the dress of men, is far more rational than men's dress in other respects; but the changing of fashions, and the determination of poor people to dress like those who are wealthy, interfere with anything like common sense in the matter except in rare instances. (See FASHION.) Consult the authorities referred to under COSTUME.

DRESS'ER, HENRY ECLES (1838—). An English ornithologist. He was born at Thirsk, Yorkshire, and, after studying in England, Germany, and Sweden, devoted himself to commercial pursuits, giving considerable time, however, to investigations in European ornithology, on which subject he is considered an authority. His most important work is *A History of the Birds of Europe,* 8 vols., with colored plates (1871-81).

DRESSINGS. In architecture, a term loosely used to signify moldings and all the simpler kinds of sculptured decorations projecting from the wall surface. It is applied particularly to the accessories of doors and windows.

DRESS REFORM. Dress reform, in the narrow sense in which it is customary to use the term, signifies a more or less definite and concerted movement against unhygienic clothing for women which began about the middle of the nineteenth century.

In the United States the earliest crusader against long skirts, high heels, a multiplicity of bands, restricted breathing capacity, and other unhygienic forms of clothing was Amelia Bloomer. In 1851 Mrs. Bloomer, as editor of *The Lily,* a paper advocating equal suffrage rights for men and women, gave some space to the discussion of a comfortable and sensible dress for women. In her case this dress took the form of full Syrian or Turkish trousers extending to the ankle in summer, and in winter tucked into high boot-tops, worn with a scant skirt coming just below the knees. The credit of originating this costume, although it has always been known by her name, Mrs. Bloomer in her writings expressly gives to Mrs. Elizabeth Smith Miller, from whom she says she copied it, as did Mrs. Elizabeth Cady Stanton. Mrs. Lucy Stone (Blackwell), another of the pioneer American women suffragists, also adopted it for a time. But all of these ladies eventually returned to a dress more closely resembling the generally accepted one of their day.

As early as 1857 a National Dress Association was engaged in trying to spread hygienic ideals of dress among the women of the United States, but their efforts seem to have been abortive at that time.

In England the Rational Dress Movement, as it was called, began in the seventies. It grew about equally from two roots—the pre-Raphaelite æstheticism, which flourished at that time, and a zeal for woven woolen clothing, which, sweeping over Germany, spread to England. The pre-Raphaelites advocated, as an artistic need, a return to the simple lines and the color combinations which they declared had not been found in English costumes since the middle of the fourteenth century. The 'antique' waist—untrammeled and large—was taught by them to be more beautiful as well as more healthful than the tapering, hour-glass waist. In spite of the clever ridicule spent upon them as apostles of a 'greenery yallery' cult, they really accomplished something for the cause of dress reform. The 'woolen' crusade of the same period, basing its arguments upon pathological rather than æsthetic grounds, also bore excellent fruit in warmer, more closely fitting, less cumbersome underclothing.

In 1874 a second National Dress Association was formed in Boston. Lectures were given by prominent physicians in which were attacked the chief evils of women's dress—namely, the corset, displacing the internal organs and interfering with the primal and most necessary function of life, breathing; the carrying of a weight of cloth upon the hips, resulting in further abdominal displacements; the long skirt impeding locomotion and harboring disease germs; the capricious and uneven nature of the protection against cold; the high heels and pointed toes of shoes, causing unerect carriage of the entire body as well as local deformities; and the face-veil, that prolific source of ocular troubles.

Systems of rational dress have been devised as a result of this movement. In the United States, Mrs. Anna Jenness-Miller became the most widely known exponent of a system combining a due regard for hygiene with some regard for beauty and for ancient prejudices. In England, Lady Harberton, president of the Rational Dress Association, became the recognized leader of the movement. Her system differs greatly from that of Mrs. Jenness-Miller, for she advocates a modification of the Turkish trouser costume, clothing her servants in it. In England there are also a National Health Dress Association and a National Funeral and Mourning Reform Association.

At the World's Fair in Chicago in 1892 a Dress Reform Congress was held, and new life was infused into the cause. So many cities organized Rainy-Day Clubs, with members pledged to wear short skirts in sloppy weather, that the rainy-day skirt is now as familiar an object of the fashion-plate and of commerce as the pelisse and the dolman once were.

In Germany the first definite effort of modern times against unhygienic clothing for women was made under the auspices of the Crown Princess of Saxony in 1873. At her suggestion Dr. Max V. Pettenkofer, professor of hygiene at the University of Munich, delivered a course of lectures on the subject which aroused some public interest. Almost at the same time Dr. Jaeger, of Stuttgart, inaugurated his crusade against all forms of clothing not woolen. The chief articles in his creed were the necessity for warmth about the middle of the body and the prevention of accumulations of fat and water. Wool, on account of its heating and absorbing qualities, he held to conduce toward this end.

There has been no widespread movement elsewhere on the Continent in favor of a more rational style of dress for women. There has been practically no legislation anywhere on the subject. A minister of education in Russia, in the last decade of the nineteenth century, attempted to prohibit the wearing of corsets by girl students under a certain age, but this piece of sumptuary legislation proved impossible.

The general participation of women in outdoor sports has probably done as much for the cause of dress reform as the conventions and agitation of the past—unless, indeed, all that agitation made the participation possible. Outdoor athletics, however, demanding short skirts, ample breathing space, light-weight but warm clothing, and the possibility of unhampered movements, and making conventional the attire which permits all these, is undoubtedly the strongest ally which dress reform has ever had. Consult: Woolson, *Dress Reform* (Boston, 1874); Bloomer, *The Life and Writings of Amelia Bloomer* (Boston, 1895); Godwin, *Dress and Its Relation to Health and Climate* (London, 1884); Haweis, *The Art of Dress* (London, 1881).

DRESS SHIP. A nautical term for ornamenting a ship with flags. It is usually done on national holidays, on the occasion of some particular fête or celebration, or in honor of some distinguished visitor, or as a mark of courtesy toward foreign nations when their own ships are dressed. In its simplest form it consists in having the national colors at the mastheads and at the peak (head of the spanker gaff) or color-staff, and hoisting the jack at its own staff in the bow. To full-dress ships additional flags are hoisted. These consist of the flags of the signal code. (See SIGNALS, MARINE.) In the case of naval vessels the flags of the navy signal code and of the international signal code are both used. The ordinary plan is to have these flags arranged in a line from the water forward (a few are on a weighted line hanging underneath the flying-jib boom) up along the line of the stays, then between the mastheads to the peak of the gaff, and thence over the stern. This is called dressing ship *rainbow fashion*. In addition the national colors are hoisted at the mastheads and aft, and jack forward, as before. Should the dressing be a courtesy to a foreign government, the colors of that nation are hoisted at the mainmast-head. Vessels having but one mast usually bring the flags past the smoke-pipes aft to the stern in two lines. No national colors are used in dressing ship except at the mainmast-head, as already mentioned, as it would be considered discourteous to exhibit one and not another, or to place one in an inferior position to that of another, and all could not be given positions of honor. Merchant ships frequently, and men-of-war occasionally, dress ship by arranging the lines of flags on each mast from the masthead to the water, following the extremities of the yard-arms.

DREUX, drē. The capital of an arrondissement in the Department of Eure-et-Loir, France, on the Blaise, 51 miles west of Paris (Map: France, H 3). The principal buildings are the Church of Saint Pierre, a fine unfinished Gothic structure of the period from the thirteenth to the fifteenth century, a splendid town hall, dating from the sixteenth century, the Doric mortuary Chapelle Saint Louis of the Orleans family, and the ruins of the ancient castle of the counts de Dreux. Dreux has extensive manufactures of coarse cloth, serge, leather, and glass, with a trade in sheep and cattle. Population, in 1901, 9697. Dreux was an important town of the ancient Gauls, and was called Durocassis or Drocæ by the Romans. It gave its name to a famous line of counts which became extinct in 1378. It was the scene on December 19, 1562, of the first great battle in the religious wars of France, when the Catholics defeated the Huguenots and took their leader, the Prince of Condé, prisoner. In 1870 it was taken by the Germans.

DREVET, dre-vā'. A family of French engravers. PIERRE (1663-1738) was born near Lyons, studied at Lyons, and then went to Paris, where he entered the studio of Gerard Audran. In 1696 he was made engraver to the King, and in 1707 became an Academician. Drevet's best work was done after portraits by Hyacinthe Rigaud. In his delicate gradation of tones and management of detail, he is hardly surpassed by any engraver of his day. He left 125 plates. Among his pupils was his son PIERRE IMBERT (1697-1739), who, when but twenty-one years old, engraved the portrait of Bossuet after Rigaud, which in every sense is a masterpiece. He surpassed his father in grace and precision, and in his use of light and shade as an interpretation of color. He succeeded him as engraver to the King, and was made a member of the Academy in 1729. He left but thirty-three plates. Among these are some beautiful specimens after Coypel and Louis de Boullogne, and fine portraits of Adrienne Lecouvreur and Samuel Bernard. CLAUDE (1710-82) was a nephew and pupil of Pierre. He was not the equal of his uncle or his cousin, but he stands well among the engravers of his time. His plates include five after portraits by Rigaud.

DREW, DANIEL (1788-1879). An American capitalist. He was born in Carmel, N. Y., where he began life as a drover and dealer in cattle. In 1834 he bought an interest in a steamboat, which was run between New York and Peekskill, in competition with the line established by Cornelius Vanderbilt. The service was improved by the addition of new boats, and in 1840 Drew became the controlling proprietor of the newly established People's Line. In 1847 he established the Stonington Line, and in 1850 made his first venture in railroading by joining with Cornelius Vanderbilt in the purchase of the railroad between Stonington and Boston. He established the banking firm of Drew, Robinson & Co., which became one of the principal traders in railroad stocks in the country. Drew became a director and large stockholder in the Erie Railroad, and at one time was said to be worth $15,000,000. Later, principally through the failure of Kenyon, Cox & Co., in which firm he was a partner, he suffered severe losses, which drove him ultimately into bankruptcy. In his prosperous days he had been a generous supporter of the Methodist Episcopal Church, erecting several church edifices, and founding the Drew Ladies' Seminary at Carmel, N. Y., and in 1866 the Drew Theological Seminary at Madison, N. J.

DREW, JOHN (1825-62). A popular Irish-American comedian. He was born in Dublin, and made his first appearance at the Bowery Theatre, New York City, in 1846. During the next ten years he acted in the principal American cities, and engaged in theatrical management in Philadelphia, where, after visits to England in 1855, and Australia in 1859, he died.

DREW, JOHN (1853—). An American comedian, son of John Drew and Louisa Lane Drew. His theatrical career began under his mother's management, in Philadelphia, in 1873. In 1879, after acting with Edwin Booth, Fanny Davenport, and other well-known stars, he became leading man in Daly's company, which he had first joined four years before. He figured with marked success in *jeune premier* rôles, in the revival of the classic comedies, notably as Petruchio in *The Taming of the Shrew,* and as Charles Surface in *The School for Scandal,* and also in Mr. Daly's new productions. After 1892 he appeared as a star, among his plays being *The Masked Ball, The Butterflies, A Marriage of Convenience, One Summer's Day, The Liars,* and *Richard Carvel.* He finds his best rôles in bantering, semi-ironical society characters. Consult Strang, *Famous Actors of the Day in America* (Boston, 1900).

DREW, LOUISA LANE (1820-97). An American actress. She was the wife of the elder John Drew, and, after him, managed the Arch Street Theatre, Philadelphia, for many years. She was born in London, but came to this country and made her début in Philadelphia when about eight years old. A half-dozen years later she was playing Julia in *The Hunchback,* and Lady Teazle in *The School for Scandal.* During her early career she appeared with Forrest and many of the greatest actors of the period. Her own most famous rôle was Mrs. Malaprop in *The Rivals,* which she performed with the utmost apparent simplicity. Mr. Drew, to whom she was married in 1850, was her third husband. Her sons, John and Sidney, and her daughter, Georgie Drew (Barrymore), all became actors.

DREWRY'S BLUFF, BATTLE OF. See BERMUDA HUNDRED.

DREW THEOLOGICAL SEMINARY. A leading educational institution for the training of Methodist Episcopal ministers. The seminary was founded at Madison, N. J., in 1866, and was named in honor of Daniel Drew, who donated grounds and buildings to the value of about $275,000. The course of study extends through three years, and is intended not only to give a thorough professional training, but to afford opportunity for a broad culture through the study of the humanities. The seminary degree B.D. is given only to graduates holding a prior academic degree. No tuition fees are charged. The seminary buildings include Mead Hall, Asbury Hall, Embury Hall, the Hoyt-Bowne Hall, the Administration Building, and the J. B. Cornell Library. The total value of the grounds and buildings is approximately $700,000, while the endowment funds aggregate about $550,000. The library is especially valuable, containing 88,000 volumes and 105,000 pamphlets. The enrollment of students in 1906 approximated 200.

DREXEL INSTITUTE OF ART, SCIENCE, AND INDUSTRY. An educational institution founded in 1891 at Philadelphia, Pa., by Anthony J. Drexel. The objects of the Institute are to train young men and women in the increasing number of industries dependent upon applied art and science, and to afford opportunity, through academic and lecture departments, for a broad intellectual culture. The courses of study are open equally to men and women; no degrees are conferred; the requirements for admission are graded in accordance with the course taken, and the tuition fees are very moderate, owing to the endowment fund established by Mr. Drexel. This endowment amounts to $2,000,000, while the total value of the Institute's property, including buildings and equipment, approximates $4,000,000. The main building, given by Mr. Drexel, is an imposing structure in the style of the classic Renaissance; East Hall, a finely appointed building, in the modern French Renaissance style, contains the notable collection of paintings bequeathed by John D. Lankenau. The museum embraces specimens in every department of industrial art. In it are many examples of the decorative arts of Egypt, India, China, and Japan, and there is also an important collection of European and Oriental textiles. The instruction and training comprise the following departments: Science and Technology; Architecture; Commerce and Accounts; Domestic Science and Economics; Domestic Arts; the Library School; Physical Training. There are also normal courses in various branches of technical instruction. In addition to the regular academic instruction, the Institute provides evening classes in all departments. These courses are graded, some of them extending over three years. The Institute carries on, furthermore, an important educational work through the means of free public lectures and concerts. The number of students in attendance in 1906 was 3000 in all departments. The library, containing 35,000 volumes, is especially strong in works on art, science, and technology. The president of the Institute from its foundation, and to whom its organization and the development of its courses must be largely ascribed, is James MacAlister.

DREYFUS, drâ'fus′, Alfred (1859—). A French artillery officer, who was brought into prominence as the central figure in one of the most celebrated cases of modern political history. He was born in Mülhausen, Upper Alsace, of Jewish parentage, removed to Paris in 1874, studied at the Chaptal College and at Sainte-Barbe, entered the École Polytechnique in 1878, and later attended the École d'Application (School of Applied Gunnery). After serving as second lieutenant in the Thirty-first Regiment of artillery at Le Mans (1882-83), and in the Fourth Mounted Battery at Paris, he was appointed captain in the Twenty-first Regiment of artillery, September 12, 1889. On April 21, 1890, he entered the Ecole de Guerre, where he ranked among the leading ten of his class. Within a year after leaving this institution, he received an appointment on the general staff. On October 15, 1894, Dreyfus was arrested on a charge of having sold military secrets to a foreign Power. The utmost secrecy was observed by the War Office in regard to the whole affair. Dreyfus was isolated in prison, and treated with great harshness. When he was tried, although he was allowed counsel, the court was a secret one, and he was sentenced to military degradation and solitary confinement on the Ile du Diable, off the coast of French Guiana. On January 4, 1895, he was conducted by a military escort to the court-yard of the Ecole Militaire in Paris, and, in the presence of a great assembly of spectators, the stripes were torn from his uniform, and his sword was broken. On March 10th he was transported to the Ile du Diable, where he was treated with severity, on one occasion being chained to his pallet for two months. He persistently denied his guilt, and this fact, together with the secrecy of the proceedings and the bitterness of the anti-Semitic agitation, led to a growing conviction in the minds of many that the real culprit had been shielded, and that it had been found convenient to put Dreyfus forward as a scapegoat.

The evidence used against Dreyfus was a memorandum, known as the *bordereau*, and the prosecution simply attempted to show that it was in the Captain's handwriting. It began, "Without news indicating that you wish to see me, I send you nevertheless, monsieur, some important information." Then followed a numbered list of documents relating to the frontier forts, artillery instructions to the general staff, etc.· Naturally it was never made known how this document was obtained by the War Office, as it would have caused complications with a friendly Power; but it was supposed to have come through an Alsatian porter in the service of Colonel von Schwarzkoppen, military attaché of the German Embassy. In May, 1896, another paper was brought to the War Office, and fell into the hands of Commandant Picquart. It bore the signature of Major Esterházy, an officer of doubtful character, and the handwriting corresponded exactly with that of the Dreyfus *bordereau*, while that of Dreyfus did not. Then began a remarkable series of attempts to bring to light and to suppress the truth. The most prominent defenders of Dreyfus were his brother Matthieu Dreyfus, the novelist Emile Zola, and M. Scheurer-Kestner, a member of the French Senate. A large part of the Liberal press also sided with the accused captain, and, during the later phases of the affair, his cause was adopted by the Socialists as a party issue for the time. Arrayed against him were the anti-Semitic elements of France and the powerful Nationalist influence, meaning by the latter all those who regarded the condemnation of Dreyfus as necessary for the vindication of the honor of the army, always dear to the hearts of Frenchmen. The War Office met the attacks of the friends of Dreyfus simply by asserting that the proceedings against him had been regular in every respect. There was a fixed purpose to prevent any discussion of the nature of the evidence or the facts of the case. Commandant Picquart, who showed an honest desire to bring out the truth, was made a lieutenant-colonel, and sent away on special service. Attempts were then made to compromise him by means of false dispatches, and he was finally removed from the active list of the army. On July 7, 1898, the agitation having risen high, a new declaration was made in the Chamber of Deputies by M. Cavaignac, Minister of War. He positively asserted that Dreyfus had been justly found guilty, and referred to certain documents not hitherto mentioned in the case. Colonel Picquart challenged these proofs and declared that of the three documents upon which M. Cavaignac based his belief in the guilt of Dreyfus, two were irrelevant, and the third, the only one in which Dreyfus's name occurred, was a forgery. Six weeks later, Colonel Henry, who had been connected with the intelligence department of the War Office, confessed to having committed this forgery, and committed suicide. This led to a general readjustment in the organization of the general staff. General de Boisdeffre, chief of staff, resigned; Major Esterházy and Colonel Paty du Clam were removed from the active list, but still the War Office proclaimed its belief in the guilt of Captain Dreyfus. Colonel Picquart was imprisoned on a charge of communicating secret documents, late in November. On the 29th of the previous month, however, the Court of Cassation, the highest tribunal in France, had taken up the matter of revision, and, after several months' deliberation, ordered (June 3, 1899), a retrial by a court-martial. The proceedings against Picquart were subsequently quashed. The court-martial sat at Rennes from August 7 to September 9, 1899, and rendered a decision that Dreyfus was guilty, with extenuating circumstances. He was sentenced to imprisonment for ten years, from which the period of his previous confinement was to be deducted. The evidence at the trial was of the flimsiest character, as it had been from the beginning, but the determination to protect the officers of the army at the expense of Dreyfus was maintained. The members of the court-martial united in a recommendation of mercy, and on September 19th the prisoner was pardoned by President Loubet.

The Dreyfus case was far-reaching in its effect upon French affairs. It divided and wrecked the Brisson Ministry of 1898; it seemed for a time likely to furnish a rallying point for monarchist agitation; it exposed a state of gross corruption in the French army; and it presented grave possibilities of trouble with Germany and Italy, which were the countries naturally suspected of the bribery of a French officer. M. Zola was condemned to a year's imprisonment, July 18, 1898, for his protest against the travesty of justice involved in the whole management of the case, and went into exile to escape imprisonment. Esterházy, after he was dismissed from the service, went to London, and made a confession through the *London Chronicle*, June 2, 1899, that he wrote the *bordereau* by order of Colonel Sandherr, assistant chief of the intelligence department. This confession was ascribed by the anti-Dreyfus party to bribery by the friends of Dreyfus. In December, 1900, in order that the matter might be finally disposed of, an amnesty bill was passed by the Government relieving every one concerned of any further liability to criminal prosecution. This was opposed by the friends of Dreyfus, Picquart, and Zola, who demanded a full vindication. The question was reopened in 1903 when a parliamentary committee of revision decided that certain "new" facts had been adduced, justifying their submission to the Court of Cassation. The criminal chamber of that court in March, 1904, ordered an investigation of the new evidence and after a delay of more than two years, pronounced its decision July 12, 1906. On the grounds that the document by which the conviction of Dreyfus in the Rennes court-martial was chiefly determined had been proven to be a forgery, and that the court-martial had failed to hear essential testimony favorable to the accused, the Court of Cassation annulled the sentence of the Rennes court-martial without ordering a new trial. Captain Dreyfus was thereby declared innocent and *ipso facto* restored to his old rank in the army. On the day following the announcement of the Court's decision, the Chambers passed a bill raising Captain Dreyfus to the rank of Major. Commandant Picquart was restored to the army with the rank of Brigadier-General and justice was done to the memory of Emile Zola by another bill, providing for the removal of his remains to the Pantheon.

BIBLIOGRAPHY. Captain Dreyfus's own story: *Five Years of My Life* (New York, 1901). He also published letters to his wife, translated by Moreau (London, 1899), and *Conseil de guerre de Rennes* (Paris, 1901). Consult, in addition: Barlow, *History of the Dreyfus Case, from the Arrest of Captain Dreyfus in 1894 to the Flight of Esterházy in 1898* (London, 1898); Conybeare, *The Dreyfus Case* (London, 1898); Guyon, *The Dreyfus Case* (London, 1898); Zola, *The Dreyfus Case* (London, 1898); Steevens, *The Tragedy of Dreyfus* (London, 1899); in French, Marian, *Dreyfus: Comptes-rendus officiels* (Paris, 1897); Esterházy, *Les dessous de l'affaire Dreyfus* (Paris, 1898); Clémenceau, *Vers la réparation* (Paris, 1899); id., *Contre la justice* (Paris, 1900); id., *Injustice Militaire* (Paris, 1902). Cornely, *Notes sur l'affaire Dreyfus* (Paris, 1898); Guyot, *L'innocent et le traître: Dreyfus et Esterházy* (Paris, 1898); Jaurès, *Les preuves dans l'affaire Dreyfus* (Paris, 1898); Reinach, *Histoire de l'affaire Dreyfus*, 4 vols. (Paris, 1901-4).

DREYSCHOCK, drī'shŏk, ALEXANDER (1818-69). A Bohemian pianist, born at Zach, Bohemia. As a pupil of Tomaschek, at Prague, he developed a technique marvelous for his time. "The man has no left hand. He has two right hands," was J. B. Cramer's exclamation after hearing him play. In 1828 he began concert touring, and continued to do so successfully for twenty years. In 1862 he was appointed a professor in the Conservatory of Music at Saint Petersburg, where he remained until 1868, when failing health compelled him to go to Italy. His compositions are of the salon order and unimportant. He died in Venice.

DREYSE, drī'ze, JOHANN NIKOLAUS VON (1787-1867). A German inventor. He was born in Saxony; served an apprenticeship with his father, a locksmith; and then worked for a time in a musket-factory in Paris. In 1814 he founded an ironware factory in Sömmerda and became interested in the manufacture of firearms. In 1827 he invented a muzzle-loading, and in 1836 a breech-loading needle gun, the adoption of which by the Prussian Army four years later led to his founding an extensive gun and ammunition factory. He was ennobled in 1864.

DRIFT (from AS. *drīfan*, Icel. *drifa*, Goth. *drieban*, OHG. *trīban*, Ger. *treiban*, to drive), or GLACIAL DRIFT. A name applied to glacial deposits in general that were formed during the Pleistocene period. The great ice-sheets which at that time covered the northern parts of North America, Europe, and Asia were efficient agents of erosion and transportation. Vast masses of loose materials, including earth, sand, and stones, were conveyed on their surface or in their lower portions, and on the retreat of the ice the materials were left behind as a compact, structureless deposit of variable thickness. The drift is variously called 'till,' 'boulder clay,' 'ground moraine,' and 'older diluvium.' It quite frequently occurs in ridges or hillocks (drumlins, kames, and eskers), in the formation of which the action of streams that resulted from the melting of the ice is apparent. The stones in drift have a characteristic appearance and surface. They are usually of oblong shape, highly polished, and have rounded edges. When the rock is fine-grained, numerous striæ may be seen running parallel to the longer axis of the fragment. Sometimes the stones have been transported long distances. The peculiar syenite known as 'laurvikite,' which occurs in the vicinity of Laurvig, in southern Norway, has been found in the drift of Denmark, in Germany, and even in Yorkshire, England. Drift deposits, when separated by an intervening stratum of non-glacial material, show changing conditions as to the advance and retreat of the ice-sheet. See GLACIER; GLACIAL PERIOD; BOULDER CLAY; DRUMLIN; ESKER.

DRIFT OF A PROJECTILE. See BALLISTICS, especially the section on *Exterior Ballistics.*

DRIFTWAY (AS. *drīfan*, to drive). A right of way for driving cattle. Such a right exists, as a *public right*, in highways, unless restricted by statute or the terms of the dedication of the highway, or it may exist as an *easement* over the land of another, acquired by grant or prescription. Not every easement of a way is a driftway, however, nor even every general right of way—the latter being commonly restricted to the more usual purposes of a way, as passing and repassing on foot or with horses and wagons. A way 'for all purposes' has, however, been held to include a driftway. See EASEMENT; HIGHWAY; WAY.

DRILL (from Dutch, Ger. *drillen*, to drill, connected ultimately with AS. *þyrelian*, to bore, Eng. *thrill*). In the broadest meaning of the word, a drill is a tool used in boring or making holes in metal, bone, ivory, wood, etc. Drills for boring wood are described under BORING MACHINES. Rock drills, or rock-drilling machines, are a separate class of tools, and are described separately below. Drills for metal, bone, ivory, etc., are made in several forms. One form consists of a square steel bar, flattened out at the cutting end. This end is brought to an angular point like a spear-head, and the cutting edges forming the angle are beveled in opposite directions. Those which have a projecting pin in the centres and chisel-shaped cutting edges on each side of the pin are called 'centre-bits.' There are various contrivances by which the drills are made to revolve. For drilling iron, steel, and large brasswork, the drilling machine (see METAL-WORKING MACHINERY) is commonly used. The best and most generally used drills for small boring are called twist drills, which have many advantages over the flat drills described above. Twist drills are made from steel rods of uniform diameter throughout their length. Upon the rod two spiral grooves are cut, each starting at the cutting edge at diametrically opposite points. At the end of the drill the grooves almost meet in the centre of the rod, but grow shallower as they continue. The cutting edges are ground on the end of the rod and the borings escape through the grooves, which constantly carry them away from the cutting edge, thus preventing clogging.

ROCK DRILLS. These may be divided into two general classes—viz. hand drills and power drills. Briefly described, a hand drill is a bar of steel having a chisel-shaped end or cutting edge. The simplest form of hand drill is worked by one man, who holds the drill in one hand and drives it with a hammer wielded by his other hand. A more efficient method of hand-drill work is, however, where one man holds the drill and another swings the hammer or sledge. Another form of hand drill, called a churn drill, consists of a long heavy bar of steel, which is alternately raised and dropped by the workman, thus cutting a hole by repeated impacts. In drilling by hand, the workman holding the drill gives it a partial turn on its axis between strokes, in order to prevent wedging and to offer a fresh surface to the cutting edge. When the conditions are such that use can be made of them, it is nearly always preferable to use power drills, on account of their greater speed of penetration and greater economy of work.

POWER DRILLS are worked by direct steam pressure, or by compressed air generated by steam or water power, and stored in receivers, from which it is led to the drills through iron pipes. (See AIR COMPRESSORS.) There are a great variety of special forms of power drills, but they can nearly all be grouped in one of two classes: (1) *Percussion drills*, and (2) *rotary drills*. The first American percussion drill was patented by J. J. Couch, of Philadelphia, Pa., in March, 1849. In May of the same year, Mr. Joseph W. Fowle, who had assisted Mr. Couch in developing his drill, patented a percussion drill of his own invention. The Fowle drill was improved by Mr. Charles Burleigh, and was first used in the Hoosac Tunnel. (See TUNNELS.) In Europe, M. Caré patented a percussion drill in France, in October, 1856. This invention was soon followed by several others; but it was not until Sommeiler's drill, patented in 1857 and perfected in 1861, was used on the Mont Cenis tunnel, that the problem of the percussion drill was practically solved abroad. Since that time numerous percussion-drill patents have been taken out in both America and Europe.

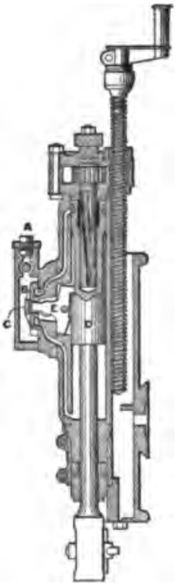


FIG. 1. PERCUSSION DRILL.

A percussion drill consists of a cylinder in which works a piston carrying a long piston-rod, and which is supported in such a manner that the drill clamped to the end of the piston-rod alternately strikes and is withdrawn from the rock as the piston reciprocates back and forth in the cylinder. Means are provided by which the piston-rod and drill turn slightly on their axis after each stroke, and also by which the drill is put forward or advanced as the depth of the hole increases. As previously stated, there are various special forms of percussion drills, and they differ from each other chiefly in the methods by which the valve is operated. All of these drills work either with direct steam pressure or with compressed air. Fig. 1 is a longitudinal section showing the interior construction of a common form of percussion drill to be operated by steam or compressed air. The steam or air is admitted at A to the chest, B. From B the slide valve, C, by moving back and forth admits the steam or air behind first one end and then the other of the long-barred piston, D. This slide valve is operated by the three-arm rocker, E, which is swung to and fro by the movement of the piston. Workable percussion drills operated by electricity are built, but so far they do not seem to have been able to compete commercially with the older forms. Fig. 2 shows sections of an electric drill which has been used to some extent. The drill is operated by a flexible shaft from a 1½ horse-power portable electric motor. This shaft is attached to a bevel gear driving a crank-shaft, A, which passes through the drill-casing. The crank-pin works in the slotted horizontal arm of the bell-crank lever B, which is mounted on a shaft journaled in the casing. The vertical arm of the bell-crank straddles the drill-rod, C, and is fitted to trunnions on a casting which slides on the rod. Between this casting and the collars on the rod are coiled springs through which the power is transmitted for movement of the arm in each direction. At the heel of the rod is a rifled section or ratchet-rod working in a rifled nut, by which the rotary movement is given to the drill-bit.

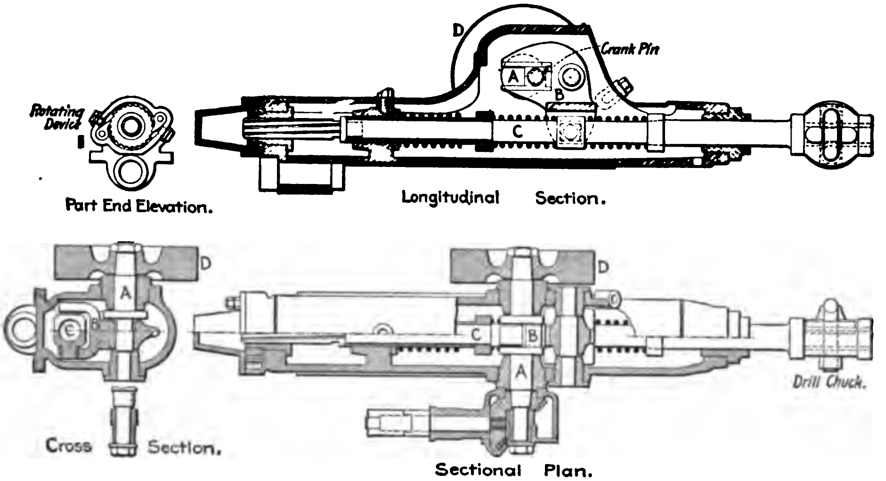


FIG. 2. ELECTRIC DRILL.

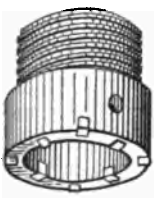


FIG. 3. DIAMOND DRILL BIT.

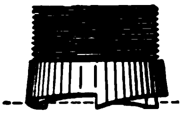


FIG. 4. BRANDT ROTARY DRILL BIT.

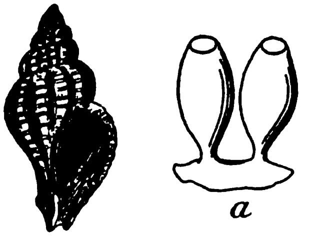
Rotary drills differ from percussion drills in the fact that the drill makes its way into the rock by a boring action produced by the axial rotation of the drill-rod. The most common form of rotary drill is the diamond drill. This machine consists of a hollow cylindrical bit having a cutting edge of diamonds (Fig. 3), which is revolved at the rate of from 200 to 400 revolutions per minute, by suitable machinery operated by steam or compressed air. The diamonds are set in the cutting edge of the bit, so as to project outward from its annular face and also slightly inside and outside its cylindrical sides. When the drill-rod with the bit attached is rotated and thrust forward, the bit cuts an annular hole in the rock, the drillings being removed from the hole by a constant stream of water, which is forced down the hollow drill-rod and emerges carrying the débris with it up through the narrow space between the outside of the drill-rod and the walls of the hole. Owing to the hollow bit, the nucleus of the hole bored is taken out as a solid core. This possibility of the diamond drill makes it a valuable tool for prospecting for minerals, or for determining the character of the material which will be met in sinking deep foundations or in driving tunnels. Another form of rotary drill which is employed in Europe for tunnel work is the Brandt hydraulic drill. The cutting edge of this drill consists of hardened steel teeth (Fig. 4). The bit is pressed against the rock by hydraulic pressure, and usually makes from seven to eight rotations per minute. Some of the water, when freed, goes through the hollow bit, keeping it cool and clearing the hole of débris. A water-pressure of from 300 to 450 pounds per square inch is required to operate these drills. Rock drills are extensively used in quarrying, tunneling, mining, and rock excavation of all kinds, and for prospecting for minerals. For a concise history of the development of rock drills, consult Drinker, *Tunneling, Explosive Compounds, and Rock Drills* (New York, 1901).

DRILL (Dan. *drille*, bore, Dutch *drillen*, to bore). In agriculture, an implement employed for planting seeds or roots in regular rows. The act of 'drilling' is distinguished from hand or broadcast sowing. In gardening, drilling has been practiced everywhere from time immemorial, but its extension to field culture is of comparatively recent date. Jethro Tull invented a drilling machine in the early part of the eighteenth century, and did much to show its merits in the culture of grain and root crops. Since his time the use of this implement has become very general. A great variety of drills are now in use. Some of them are adapted to the distribution of fertilizer along with the seed. One great recommendation of drilling is that by means of it a considerable saving of seed is effected, and that especially with close planted crops, such as wheat, the seed is more regularly sown and better covered; a further advantage is that with crops which are cultivated between the drills it enables the farmer more readily to clean the land, both by the hand and by the horse hoe. Retention and absorption of the moisture is facilitated by keeping the soil stirred and pulverized, which can only be properly done where the crops have been sown in drills. See IMPLEMENTS, AGRICULTURAL.

DRILL. A general title for the various systems of exercises and methods of instruction by which organized bodies of men are made uniformly efficient and effective for the purposes of the organization of which they are a part. Specifically it has direct reference to the different details of training by which soldiers and sailors are organized and qualified for their duties. The various European manuals of drill were based originally on the Prussian system of Frederick the Great, and have been adapted since to such particular needs of the nations as have been dictated by national evolution and the improved inventions of modern scientific warfare. See TACTICS, MILITARY; MANUAL OF ARMS.

In the United States Navy the drills are very numerous. In addition to the fleet or squadron drills, which comprise fleet tactics, battle tactics, and numerous special exercises, the drill of crews of ships comprise: clearing ship for action; general quarters (drill at stations for battle); fire quarters and fire drill; collision drill; battery drill, including drill at the heavy guns and secondary battery and supply of ammunition, instruction at the guns, etc.; torpedo drill and instruction; target practice (q.v.), with all calibres of guns, with full-calibre ammunition, sub-calibre ammunition, record practice, preliminary practice, battle practice, small-arm practice, aiming drill, etc.; field-artillery drill with three-inch field guns; infantry drill, including manual of arms and tactics, and exercise as a landing party or body of infantry making a landing and then operating on shore; boat drills, exercise with oars, with sails and tactical drill; also many other special drills as coaling-ship drill, "man overboard," etc. In the older ship there are also sail drills, spar drills, etc. See GUNNERY; TACTICS, NAVAL.

DRILL. Any of several small gastropods which bore through the shells of other mollusks and suck out their juices, such as species of Natica, Purpura, Anachis, Astyris, Tritia, Ilyanassa, and others. The most numerous in the waters off the east coast of the United States, and most troublesome, is Urosalpinx cinerea, which is exceedingly destructive of oysters on cultivated beds. It is this, says Ingersoll, which is the common 'drill' of the oyster-beds; and it is its eggs, laid in small vase-shaped capsules, which are often found in groups attached to the under surface of stones. The natural home of the drill is the tide-pools and weedy borders of rocky shallows, where barnacles, hydroids, anemones, rock-loving limpets, and other associated forms that find shelter among the algæ afford it abundant food. Though this is precisely where the mussels grow till the rocks are almost black with them, it is said that they are never attacked by the drills. The increase of these mollusks when they colonize upon an oyster-bed is very rapid, and the damage serious; but it is very difficult to combat them, and perhaps impossible to get rid of them. Consult: Goode, *Fishery Industries*, i., p. 696 (Washington, 1884); Ingersoll, *Oyster Industry of the United States* (Washington, 1882).



A DRILL.
Shell and Egg-capsules (a) of *Urosalpinx cinerea.*

DRILL (from *mandrill*, baboon, probably a West Indian word; divided by popular etymology into *man* + *drill*). A West African baboon (*Cynocephalus leucophæus*), similar to the mandrill (q.v.), but rather smaller, and distinguished by the absence of any bright color on the face. The general color of the fur is brown, having a greenish tinge in some lights, rather paler on the under parts and whitish on the tufted forehead. The female is rather smaller and paler than the male; the naked parts of the face are ivory black, and not ribbed. Almost nothing is known of this baboon in nature, but in captivity it behaves much as do its cousins. See BABOON, and Plate of BABOONS.

DRILL (abbreviation of *drilling*, Ger. *Drillich*, OHG. *drilich*, ticking, from Lat. *trilex*, three-threaded, from *tres*, three + *licium*, thread; associated by popular etymology with Ger. *drei*, three + termination *-ing*). A fine twilled linen fabric of a satiny finish.

DRILL REGULATIONS. Official works prescribing for the units of organization the method of training and instruction, their formations, manœuvres, and ceremonies, and in a limited sense their battle tactics. The *forms* in which the units of organization learn their duties and perform them, at rest and in motion, are embodied in the drill regulations prescribed by the various nations. They are, from their nature, next to organization, the foundation for the tactics of an army.

Drill regulations are undergoing constant change, due to improvements in firearms and the experiences of the most recent wars, as well as the improvements in other fields of science. Those for the various branches of the line—cavalry, infantry, artillery—are comparatively stable, although even these are changed almost every decade. Those for heavy artillery of all kinds must change with every alteration or improvement in the piece, its carriage, or the emplacement accessories. See ARMY ORGANIZATION; and TACTICS, MILITARY.

DRI'MYS. See WINTER'S BARK.

DRINKER MOTH (so called from its long proboscis). An English foliage-destroying moth (*Odonestis potatoria*), closely allied to the egger.

DRINKING USAGES. As religious observances, drink-offerings were common among the ancients, both Jews and pagans. To mark the spot where he communed with God, Jacob set up a pillar of stone and 'poured a drink-offering thereon' (Gen. xxxv. 14), and women are said to have poured out drink-offerings unto other gods (Jer. vii. 18). On occasions of solemn prayers and before their eating and drinking, the Greeks and Romans poured from the cup to the ground a small quantity of the liquid—either undiluted wine, milk diluted with water, or water flavored with honey. A relic of the custom was recently noted in the island of Samos. The health-drinking custom comes from antiquity. Homer's Odysseus, when about to leave the Phæacians, rises from the couch and places the drinking-bowl in the hands of Alcinous's wife with the words, "I drink to you; be happy." So, too, with the early Romans, the drinking of healths was a common custom, simply observed with a homely formula. Plato and Xenophon have described the famous *symposia* or drinking parties of the Greeks, which under the name *commissatio* came into vogue in Rome under the Empire. These followed the feast and were enlivened by games, riddles, and the music of the lyre. Wine and water were mixed for the whole company in a *crater* (bowl), from which the *pocula* (cups) were filled. One of the party formally elected to the office of *arbiter bibendi* (master of the revels) decided the strength of the beverage, the toasts to be drunk, and other matters connected with the festivities; or less formally each guest suited his taste in the mixing of the wine and water. Frequently the number of letters in the name of the one whose health it was proposed to drink decided the *cyathi* (measuring-cups) of wine (Martial xi. 37). When a person drank wine with another he first tasted of the cup himself and then handed it to his friends, with the words, *Propino tibi* (I drink to you), or more colloquially *Bene vos*, and received his cup in return. Among the Celts and Germans a similar custom existed, but without much ceremony. There was a common bowl of wine; the first to drink took a sip, turning to his neighbor with an "I drink to you," and the bowl made the rounds of the table. There was no trace of the libation to the gods which was customary among the Greeks and Romans.

The Christians took up the pagan custom, and in their feasts expressed good wishes for the bodily health and future welfare of their friends. An abuse crept in which savored of idolatry and profanation—the drinking to the dead and to the saints. This latter custom was anathematized by a council at Nantes and gradually fell out of use; but drinking to the dead is not uncommon even to-day. It has been said that the practice of saying "I'll pledge you" originated during the tenth century, when the English were fearful of the treachery of the Danes. When one of the company stood up to drink to another, the bowl raised high with both hands and his back exposed to a murderer's blow, his companion next him stood up also and raised his drawn sword to defend him while drinking; he was his *pledge* responsible for his protection. The *wassail-bowl* became the *poculum caritatis* of the monastery. On New Year's Day it was placed before the abbot, and from it the superior drank to all, and the rest in succession to each other. Hence the origin of the 'grace cup' of the universities and the 'loving cup' of the corporation feasts in London, whose formalities recall those connected with the ancient wassail-bowl. After dinner the master and wardens "drink to their visitors in a loving cup, and bid them all heartily welcome." The cup (a silver flagon containing warm spiced wine) then circulates round the table, the person who pledges standing up while his neighbor drinks to him.

Excessive gallantries accompanied the drinking of healths during Elizabethan times. Just as the Roman lover wrote his mistress's name with wine on the tables, the English gallant would write it with his blood, or even stab his arm and drink to her health in his blood. Drinking healths on the knees, and often with the knees bared, was of common occurrence. And doing honor to a lady by tossing into the fire some jewel or ornament of dress, with a bidding to their companions to follow, was a custom among lovers even into the nineteenth century. The Puritans would have no drinking of healths; but with the restoration of Charles II. it was again carried to great excess. See TOAST.

Many old drinking usages, still kept alive by the class that clings to old traditions, are connected with occasions of births, baptisms, marriages, and deaths. The gloomy festivity of the *lykewake*, or wake, over the corpse of the deceased, in Scotland and Ireland, and the former drinking of the *dredgy* (dirge) after funeral solemnities, are relics of very ancient customs.

As regards miscellaneous drinking observances at one time common, we can refer but to few of the more prominent. Apprentices, on being introduced to a workshop, paid so much entry money to be spent in drink, and similar exactions were made from journeymen on entering a new employment. This was called paying their footing. When Benjamin Franklin, on getting employment in a printing office in London, refused to comply with this mischievous custom, he experienced, as he tells us, a variety of petty annoyances. Among shipwrights the penalty of nonpayment was flogging with a handsaw from time to time and other maltreatment. Happily, the abolition of these usages has kept pace with the increasing intelligence of the working classes, but even nowadays the last student entering the French *atelier* must treat the rest. Prisoners, on being lodged in jail—as related in the novels of Smollett and others—were obliged to pay *garnish* for drink to the brotherhood of which they had become members. The efficacy of modern prison discipline has done away with such exactions.

The giving of *vails* (Lat. *vale*, farewell) to servants on quitting a gentleman's house, which became so intolerable in the eighteenth century as at length to be given up by universal consent, meant, doubtless, a gift to be spent in drink to the health of the donor, and was analogous to the custom of giving a *Trinkgeld* in Germany and a *pourboire* in France to servants, drivers of carriages, and others. There were at one time numerous drinking usages connected with departures. We need only notice the *bonailie* (Fr. *bon aller*), or, as it is sometimes called, a *foy* (Fr. *voie*), a festive drinking at the going away of servants or of persons in a still higher degree, once common in the lowlands of Scotland; also the *stirrup-cup*, or, as it is called in the Highlands, *deoch an dorris*, or drink on getting on horseback and being ready to set off. For the decline of drinking habits in general, see the article TEMPERANCE in this Encyclopædia. Consult Dunlop, *Drinking Usages of Great Britain* (London, 1839); and Mew and Astion, *The Drinks of the World* (London, 1893).

DRIPSTONE. A projecting molding or tablet placed over the head of a Gothic doorway or window, for the purpose of throwing off the water, whence it is also known as a water-table or weather-molding. Though such was, no doubt, its primitive use, it latterly became a mere ornamental appendage, which served to enrich and define the outline of the arch. It does not generally extend lower than the springing of the arch, though this rule is by no means without exceptions. When the tracery extends to a lower level, the external dripstone usually accompanies it, and Parker mentions that, at the north doorway of Otham Church, Kent, it descends the whole length of the jamb. The dripstone is not so constant a feature in Continental as in English Gothic.

DRISLER, drĭs′lẽr, HENRY (1818-97). An American classical scholar and educator, born on Staten Island, N. Y. He graduated at Columbia in 1839, was appointed tutor of Greek and Latin there in 1843, and adjunct professor of Greek and Latin in 1845. From 1857 to 1867 he was professor of the Latin language and literature, and from 1867 until 1894, when he became professor emeritus, professor of the Greek language and literature. He was acting president of Columbia in 1867, during the absence of President Barnard as United States Commissioner to the Paris Exposition of that year, and again in 1888-89, after the retirement of President Barnard and previous to the election of President Low. In 1890-94 he was the first dean of the Columbia School of Arts. His extensive and valuable library was dispersed by sale after his death. He assisted Dr. Charles Anthon (q.v.) in the preparation of a series of text-books, and reëdited, with corrections and additions (1854), the *Greek-English Lexicon* of Liddell and Scott, rendering important coöperation in the revision connected with the seventh Oxford edition of that work (1883).

DRIVER, drī'vẽr, Samuel Rolles (1846—). The leading Hebrew scholar in England of the critical school, born at Southampton. He graduated B.A. at Oxford, 1869; was fellow and tutor 1870-83; succeeded Pusey as regius professor of Hebrew and canon of Christ Church, Oxford, in 1883. His chief publications are: *A Treatise on the Use of Tenses in Hebrew* (1892); *Notes on the Hebrew Text of the Books of Samuel* (1890); *Isaiah: His Life and Times* (1893); *An Introduction to the Literature of the Old Testament* (1897); commentaries and annotations on Leviticus (1894-98), Deuteronomy (1895), Daniel (1900), Joel and Amos (1897). With Francis Brown and Charles A. Briggs he is now preparing a Hebrew and English lexicon of the Old Testament.

DRIVER ANT, or Visiting Ant. A West African doryline ant (*Anomma arcens*), nearly half an inch long, and blind, which goes about, mainly at night, in 'armies' that destroy all the smaller creatures overtaken. When they reach a village the negroes are obliged to quit their houses as long as the ants remain, and "all the rats, mice, lizards, cockroaches, and other vermin . . . are either compelled to decamp hastily, or are caught, killed, and devoured." They are said to have no fixed abodes, but to follow a nomadic life, crossing rivers by clinging to one another in a living chain or bridge, over which others pass; or, when aroused by floods, gathering into spherical masses and floating until they drift ashore. A very complete account of their habits is given by Wilson in *Western Africa* (New York, 1856), from which the following facts are quoted: "When about to cross a well-trodden path where they (the column) are likely to be disturbed, the soldiers weave themselves into a complete arch, extending across the whole width of the path, under which the females and the laborers bearing the larvæ pass without the least exposure. I have frequently put the end of my cane under the arch and raised it full five feet from the ground without letting a single ant fall."

DRIVING (from *drive*, AS. *drīfan*, Icel. *drīfa*, Goth. *dreiban*, OHG. *trīban*, Ger. *treiben*). The art of driving one or more horses, with the greatest security and comfort to all concerned, is as important to the horse as to the driver; and yet, notwithstanding the experience of centuries, it still remains an art utterly unknown to the vast majority of men and women who are in the regular habit of driving, whether for business or pleasure. The essence of good driving is to secure the maximum of results in security and pleasure, or work, with the minimum of effort or strain to either horse or driver. Pleasure driving is confined to a single horse, or a pair in double harness side by side, or a pair tandem fashion. Modern conditions of road and street traffic compel the adoption of definite rules for each of these and demand that the thoroughly equipped driver be at all times ready and able to adjust himself to circumstances as they vary from moment to moment. Above all, a connection or bond of sympathy should be established between the driver's hands and the horse's mouth, so that prompt indication may be made of any intention to change the direction. In driving a single horse, the driving or left arm should be held easily and sufficiently forward for the right arm to be able to come to its assistance, with sufficient space between the rein hand and the body to insure the possibility of drawing the reins in without swaying the body backward. The third or fourth finger should press on the reins, preventing them from slipping. When the right hand is needed to aid the left, the second, third, and fourth fingers of that hand are placed between the reins, and the first and second placed on the right rein, grasping it, but keeping each rein of equal length. To turn to the right, bend the wrist over in such a manner as to bring the thumb undermost toward the left hip; and for a turn to the left, bring the little finger undermost and incline it toward the right hip. The driving (left) hand must be held straight in the centre of the body, with the knuckles of the hand to the front, and the forearm exactly square to the upper arm, the elbow and back of the fingers (when shut over the reins) lightly touching the (driver's) coat. Mannerisms or affectation of any sort are regarded as extremely bad form, and severely condemned. The whip is held in the right hand, grasped in such a manner as will give it the best balance, either for carrying or for service. With a well-made properly balanced whip this would be about fifteen or sixteen inches from the butt. The whip must never be used unnecessarily, any more than the bit is to be pulled or jerked by the reins. If bearing reins are used, care must be taken that they are never so short as to fret the horse. A slight drawing of the reins—pulling them sufficiently taut gently to 'feel' the horse's mouth—indicates to the properly trained horse the signal to move off. *Driving two horses abreast* is effected in the same manner, there being but two reins in the driver's hands. When two horses are driven *tandem* fashion, the one before the other, four reins come into use, and much of the practice of four-in-hand driving applies.

For *coach*, or *four-in-hand driving*, the reins should be of a width and thickness regulated by the length of the driver's fingers. Before mounting take in the left hand the rein that draws through the centre of the terret of the left-hand wheeler's pad (this is the near-side leader's rein), and draw it until it bears on the bit. Next pull the right leader's rein through in the same manner, and pass them to the right hand. Then pull first the left and then the right wheeler's reins through the finger-spaces of the left hand. Having assembled all the reins in the left hand, pass them between the corresponding fingers of the right hand, leaving the left hand free to grasp the rail and mount to the driving seat. In mounting, the left foot is placed on the wheel-box, the right on the splinter-bar, followed by the left foot on the step and the right foot on the footboard of the box, whereupon the driver speedily seats himself. Once seated, the feet are brought close together; the left hand so placed that it will be on a level with the lowest vest button, the forearm as nearly as possible horizontal, and similarly, the hand in the centre of the body, which it touches with the back of the fingers, the knuckles being straight to the front.

The wrist must be able to work backward and forward like a spring. The horses are notified to start by lightly drawing in the reins, so as to secure a slight pressure on every horse's mouth, after which a sign or a cry will notify the grooms to stand clear, and the horses will move off together. The team must be started at a walk, and the driver be prepared to hold in the leaders. Never use the whip unnecessarily, and before doing so, in any event, have all the horses well in hand. To shorten the reins, take them between the fingers of the right hand and pull them back through the fingers of the left. To ease the left hand, change the reins into corresponding position in the right, but only when on a straight, clear road. Keep the leaders slightly in, so that their traces are slack. Go up-hill at a trot, or even at a gallop, as it keeps the team more even. Downhill, the horses should be well in hand. To turn to the right, take the right-hand leader's and wheeler's reins about eight inches away from the left hand, and pull them until the right hand is near the body; drop the left hand gently, then, as the team comes round to the right, steady the right-hand horses, ease out the reins of the left-hand ones, and the team will straighten out. The turn to the left is a reversal of these methods. Stop gradually, taking in first the leaders' reins, then the wheelers'. Bring the team down to a slow trot and let them be almost at a walk before coming to a full stop. Pass the reins to the right hand and dismount.

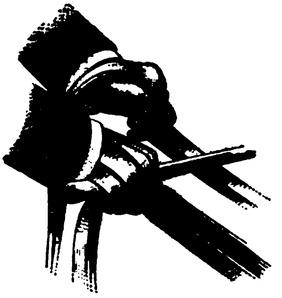


FIG. 1.

The position of the reins in the driving hand is a much-disputed point, and one to which too much importance cannot be attached. Driving in America has naturally been considerably influenced by the methods employed in England; and the 'tooling' of fashionable coaches is still apt to be after the English fashion. The strictly American method of holding the reins is seen in Figs. 1 and 2, the latter being known as the 'clubbed' hand. When all the reins are held in one hand, a rein in each finger-space, it is called a 'full hand' (Fig. 3), a method once very popular on the Continent of Europe, and even now considered good form in France. The great objection to the method, however, is that the off-wheel rein, on top of the little finger, cannot be firmly held, owing to the insufficiency of strength in that finger. In Switzerland and Italy, the professional coachmen employ many different methods of handling, although all of them seem to be opposed in practice, at least, to the old French custom, or 'full hand,' already explained. The method of the Saint Moritz diligence (Fig. 4) is perhaps the best method employed on the Continent, and resembles the English in that the lead reins and the wheel reins each adjoin; a method also employed by professional stage-coach drivers in America. In six-horse driving the English method is practically universal (Fig. 5). The lead reins, together with those of the middle pair, are held in the same position as would be the leaders and wheelers in four-horse driving; and the reins of the wheelers are then placed on the two sides of the third finger, below all the others. Much more easy of control and handling is the method of harnessing three abreast on the lead, with two at the wheel. Consult Ware, *Driving* (New York, 1903); Anderson and Cullier, *Riding and Driving* (New York, 1905).

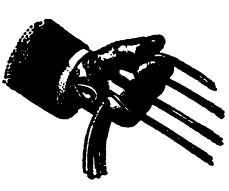


FIG. 2.

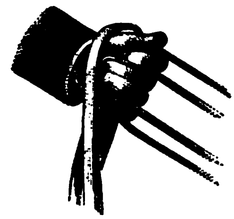


FIG. 3.

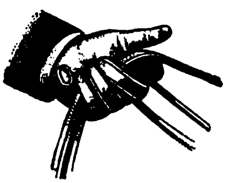


FIG. 4.

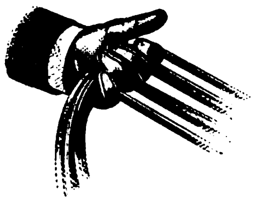


FIG. 5.

DRIVING, FURIOUS. The offense of driving or otherwise propelling vehicles over a public road or highway at a dangerous rate of speed. Furious and reckless driving on thronged thoroughfares is an indictable offense at common law, punishable by fine and imprisonment. The offense has become statutory in England, and prosecutions are now usually brought under the statutes governing the matter, though the common-law remedy is still available. In the United States such legislation has been sustained as coming within the police power of the State Legislatures. In cities and incorporated villages the rate of driving and of propelling street cars, bicycles, automobiles, and other vehicles is usually regulated by municipal ordinances, having the force of legislative enactments, fixing the maximum rate of speed permitted.

DROBISCH, drō′bĭsh, GUSTAV THEODOR (1811-82). A German poet and author, born in Dresden. In 1847 he became the editor of the *Zeitung für die elegante Welt*, at Leipzig, which he conducted for thirteen years. He was widely celebrated as a humorist, was editor of the

Witz- und Karrikaturen-Magazin, and published the following contributions to humorous literature: *Amarillen und Bartnelken* (1857); *Humoristische Liedertafel* (1863); *Bunte Glasuren* (1865); and *Komische Vorträge* (5th ed. 1892).

DROBISCH, Moritz Wilhelm (1802-96). A German philosopher and mathematician. He was born and educated at Leipzig, and in 1826 became professor of mathematics at the University in that city. In 1842 his title was enlarged so as to include also the professorship of philosophy. He began his literary career as a disciple of Herbart, and though in his later philosophical works he showed decided independence of thought, he remained Herbartian in his general attitude. He was also distinguished as a mathematician and psychologist, and was especially interested in the application of mathematical laws to psychic phenomena. His philosophical writings include: *Beiträge zur Orientirung über Herbart's System der Philosophie* (1834); *Neue Darstellung der Logik nach ihren einfachsten Verhältnissen* (5th ed. 1887); *Grundlehren der Religionsphilosophie* (1840); *Empirische Psychologie nach naturwissenschaftlicher Methode* (1842); *Erste Grundlinien der mathematischen Psychologie* (1850); *Kants Dinge an sich und sein Erfahrungsbegriff* (1885).

DROGHEDA, drŏg'e-dȧ (OIr. *Droicheadatha*, bridge of the ford). A seaport, municipal borough, and civic county on the borders of Meath and Louth, Ireland, situated on both sides, but chiefly north, of the Boyne, four miles from its mouth, and 31 miles north of Dublin (Map: Ireland, E 3). The Dublin and Belfast Railway crosses the Boyne here by a viaduct 95 feet high. There are linen and cotton manufactures, tanneries, breweries, and an iron foundry. It has a considerable trade, chiefly with Liverpool, principally in corn, meal, flour, cattle, provisions, linen, hides, and butter. Great quantities of ale are exported. Each census since 1841 shows a falling off in the population. At that date it contained 17,300 inhabitants, while in 1891 the population numbered 13,708; in 1901, 12,765. Drogheda was a political and ecclesiastical centre as early as the twelfth century. Its antiquarian remains include Saint Mary's Abbey, the Magdalen tower of the Dominican priory where the Irish chieftains surrendered to Richard II., the 'Tholsel' or town hall, and the ruined West Gate and perfect Saint Laurence Gate of the ancient fortified walls. The two divisions of the town were united by a charter from Henry IV. in 1412. Poyning's Laws were enacted in 1494 by a Parliament assembled here. In 1649 Cromwell stormed the town and slaughtered its inhabitants. It surrendered to William III. after the battle of the Boyne, fought some two miles from the town. Consult Barnard, *The Siege of Drogheda* (Dublin, 1736).

DROGIO, drō'jė-ō. The name given by the fourteenth-century Venetian traveler Antonio Zeno to a vast country southwest of Estotiland (Labrador?). The land is probably mythical.

DROHOBYCZ, drō'hô-bĕch. A town of Galicia, Austria, situated near the left bank of the Tysmienica, a tributary of the Dniester. It is about forty miles south-southwest of Lemberg (Map: Austria, H 2). Its only public buildings of note are the castle, surrounded by extensive grounds, and the handsome Gothic parish church. The chief industry is the preparation of salt, obtained from mines in the vicinity. There is also a brisk trade in grain, cattle, leather, and petroleum. Population, in 1890 (commune), 17,900; in 1900, 19,146.

DROIT D'AUBAINE, drwă dō'bān' (Fr., alien's law, Lat. *alibi nati*). A harsh rule of French law whereby all the property, real and personal, of an alien dying in France was confiscated to the Crown. The rule was limited to property found within the jurisdiction of the Crown, and to foreigners who were domiciled within the territories of the French King. It had no application to travelers, foreign merchants trading in France but not residing there, nor to the representatives of foreign powers. A few foreign nationalities, as the Swiss, Savoyards, Scotch, and Portuguese, were also exempted. It survived until 1819, when it was finally abolished. For the status of aliens generally, see Alien; Citizen; Subject.

DROITWICH, droit'ĭch (OF., Fr. *droit*, right, customs duty + Eng. *wich*, *wick*, salt-spring, Icel. *vik*, creek, Lat. *salinæ*, salt-springs). A municipal borough in Worcestershire, England, seven miles north-northeast of Worcester, in the narrow valley of the Salwarpe, and on a canal connected with the Severn, which admits vessels of 60 tons (Map: England, D 4). It has direct communication, also, by means of other canals, with Birmingham and London and the intermediate district. Its chief trade is salt, for which it has been famous from remote times. In the middle of the town, rising from a depth of 200 feet through beds of new red sandstone and gypsum, are the celebrated wyches, or brine-springs, containing between 35 and 40 per cent. of pure salt, and yielding annually over 100,000 tons of salt, a large part of which is exported to foreign countries. The saline baths are much frequented. Population, in 1891, 4021; in 1901, 4163. The remains of a Roman villa, with tessellated pavements, etc., were found here.

DRÔME, drôm. A southeastern department of France, bounded on the west by the Rhone (Map: France, M 7). Area, 2534 square miles; population, in 1896, 303,491; in 1901, 297,321. Toward the east the surface is hilly, a spur of the Alps traversing the eastern limits, and sending offshoots of about 3500 feet in average height westward across almost the entire area of Drôme. These heights, covered with forests of pine, oak, and beech, afford excellent pasturage in summer and autumn. The general direction of the rivers is westward, toward the Rhone; the most notable are the Drôme, from which the department takes its name, and the Isère. Vines and mulberry, chestnut, walnut, and olive trees are extensively grown. In the production of mulberry leaves and in silkworm culture, Drôme is one of the leading departments of France. The manufactures consist chiefly of woolen cloth, silk, hosiery, serge, and cotton yarn. Capital, Valence.

DROMEDARY, drŭm'ė-dȧ-rĭ (OF. *dromedaire*, Lat. *dromedarius*, from Lat. *dromas*, Gk. δρομάς, *dromas*, a running, from δραμεῖν, *dramein*, to run). A name sometimes given to the Arabian or one-humped camel (*Camelus dromedarius*), but properly belonging to a variety of that species, distinguished by slenderness of limbs and symmetry of form, and by extraordinary fleetness, "bearing much the same relation to the ordinary camel as a race-horse or hunter does to a cart-horse." A good one is valued in upper Egypt at from $50 to $75. The pace of the dromedary is a trot, which it can maintain for a prodigious length of time, often at the rate of nine miles an hour for many hours together; while a journey of upward of 600 miles is performed at a somewhat slower rate in five days. Even its more rapid pace can be maintained for twenty-four hours at a stretch, without sign of weariness and without stopping to bait; and if then it is allowed a little refreshment, of a ball of paste made of barley and powdered dates and a little water or camel's milk, it will resume its journey, and go on with undiminished speed for twenty-four hours more. The jolting to the rider is terrible. The gallop is a pace unsuitable to the dromedary, and at which it very soon fails. See Camel; and Plate of Camels and Llamas.

DRO′MIO OF EPH′ESUS and **DROMIO OF SYR′ACUSE′.** In Shakespeare's *Comedy of Errors*, twin brothers who had been separated in childhood, and, at the opening of the play, have become attendants, respectively, of Antipholus of Ephesus and Antipholus of Syracuse. The first-named is thick-witted, the second is bright.

DRONE. See Bee.

DRONE (of a bagpipe). See Bagpipe.

DRONE FLY (so called from its resemblance to a drone). A common cosmopolitan fly of the family Syrphidæ (*Eristalis tenax*). Its larvæ live in liquid filth and the putrefying carcasses of animals, breathing by means of a very elongated anal projection bearing spiracles at the tip; they are sometimes called 'rat-tailed maggots.' The fly somewhat resembles the honey-bee, and this resemblance has given rise to the 'Bugonia myth,' which is found among many nations, and is of ancient origin (Judges xiv. 8), to the effect that honey-bees may be born from filth or decaying bodies.

DRON′GO (Neo-Lat. *drongus*, from the Malagasy name), or Drongo-Shrike. A bird of the passerine family Dicruridæ, which is widely scattered throughout Africa and southeastern Asia, and whose systematic position is undecided. The beak is very shrike-like, and beset with bristles at the base, in conformity with the insect-eating habits of the family. The plumage is invariably glossy black, the tail has ten feathers, is forked, and the outer rectrices are often greatly prolonged, or curled or racket-shaped. These birds are wholly arboreal, active on the wing, restless and pugnacious, and nest in trees. Several genera and many species are recognized. Most of them inhabit India and Malaysia, but two species are natives of South Africa and one of Australia. See King-Crow.

DRONGO CUCKOO. An East Indian cuckoo (*Surniculus dicruroides*) remarkable for so resembling the common drongo, or king-crow (see Drongo) as to deceive any but a careful observer. This instance of 'mimicry' among birds is carried to the extent of imitating the forked tail, "a feature elsewhere entirely unexampled among the cuckoos." Ornithologists are of the opinion that this cuckoo, which is parasitic, selects the nest of the drongo, alone, as the receptacle for its egg. Several others species exhibit similar tendencies.

DRONTE. See Dodo.

DRONTHEIM, drōnt′hīm. See Trondhjem.

DROOD, Edwin. See Mystery of Edwin Drood.

DROOGENBROECK, drō′gen-brōōk, Jan van (1835-1902). A Flemish poet whose pseudonym was Jan Ferguut. He was born at Saint Amands on the Scheldt, and was educated at Lierre. He was for more than twenty-two years tutor and professor at a well-known music school of Brussels. As a poet, he was the first to introduce Oriental verse-forms into Dutch poetry, among his best productions of this kind being the celebrated *Makamen en Ghazelen* (2d ed. 1887). In 1886 he received a prize at Brussels for the treatise entitled, *De toepassing van het Grieksche en Latijnsche metrum op de Nederlandsche Poëzie.* His poems of childhood, entitled *Dit zijn Zonnestralen* (6th ed. 1884), are extremely popular. He also wrote the libretto to Lortzing's opera *Undine* (first performed in 1862).

DROPSY (by aphæresis, for the older form *hydropsy*, Lat. *hydropisis*, Gk. *ὑδρωπίασις*, *hydrōpiasis*, *ὕδρωψ*, *hydrōps*, dropsy, from *ὕδωρ*, *hydōr*, water). A symptom occurring in several diseases. It consists of the effusion of watery fluid from the blood into the skin and subjacent tissues, or into the cavities of the body. When the effusion is chiefly in the superficial parts and over the whole body, the dropsy is called *anasarca;* when it is in the peritoneal cavity of the abdomen, it is termed *ascites;* when in the chest, *hydrothorax.* Dropsy most commonly depends on disease of the heart (q.v.) or kidneys (q.v.), or upon the condition of the blood. *Ascites* is often caused by pressure upon the portal veins caused by a contracting liver, in a case of cirrhosis of that organ. The treatment of dropsy is chiefly by diuretics, diaphoretics, and cathartics, which remove the fluid from the tissues by unloading the blood of serum. It is, however, a matter of some difficulty to find the proper remedy in every individual case. In all cases of dropsy, the internal organs should be submitted to a strict medical examination, and the treatment regulated accordingly. The fluid which is poured into the cavity of the pleura in pleurisy is not dropsical, but an exudation of plastic material from the blood which has the property of becoming organized and forming adhesions between the lungs and the sides of the chest. In hydrothorax the fluid has no power of organization, although it contains blood-serum. The presence of cysts in an ovary is called ovarian dropsy. Dropsy of the pericardium is called *hydropericardium;* of the cavity of a joint, *hydrops articuli*, or *hydrarthrosis;* of the cavity of the scrotum, *hydrocele;* of the skin and areolar tissue, *œdema.* If the cerebro-spinal fluid be increased, the condition is called *hydrocephalus.* When internal medicines fail to remove an accumulation of dropsical fluid, or when it is due to pressure which cannot be relieved, it often becomes necessary to evacuate the fluid by tapping —that is, by making an incision into the cavity and drawing off the fluid through a tube. This operation, under antiseptic precautions, is practically free from danger, and may be repeated from time to time by the surgeon as the pressure or weight of the accumulation becomes important. Excessive dropsy of a limb is sometimes relieved by making several punctures through the skin.

DROPWORT. See Spiræa.

DROS′ERA. See Sundew.

DROSOM′ETER (from Gk. *δρόσος*, *drosos*, dew + *μέτρον*, *metron*, measure). An apparatus for measuring the quantity of dew formed in a unit of time per unit area of surface. The surface may be either a horizontal metal plate or a leaf hanging naturally, or a bit of wool or cotton representing a large surface of fine fibres. The unit of time is usually one hour, and the measurement is made in the early morning, before the rising sun evaporates the dew. When the apparatus is made self-registering, the surface, with its accumulating dew, hangs at one end of a delicate balance, or from a delicate spiral metallic spring, and by its gradual sinking moves the index that makes the record on a moving sheet of paper. Although many forms have been suggested, yet none have been considered to give results that are comparable with each other from day to day, owing largely to the fact that the slightest change in the surface that receives the moisture alters the quantity of dew that is caught. Even the same bit of wool, when used day after day, changes its nature in this respect. If a metallic surface is used, its behavior must be compared frequently with a standard, partly because different metals have different properties, but principally because the same surface, when it becomes greasy, dirty, or scratched, has different properties. Many peculiarities of the deposition of dew on different objects are explained in detail in the popular work by Charles Tomlinson, entitled *The Dew-drop and the Mist* (London, 1860). Moreover, the case of the natural deposition of dew on the grass and other plants very near the surface of the ground is not at all parallel to that where it is deposited upon metal plates or other bodies used as drosometers, partly because of the location, partly because of the difference in the substances, and largely because of the influence of slight local currents of air.

DROSSINIS, drôs-sē̆′nĭs, George (1859—). A modern Greek writer. He was born at Athens, and although originally a lawyer, later devoted himself entirely to belles-lettres. His works, which are characterized by simplicity of language and genuine feeling, include five collections of lyrical poetry and the following prose writings: *Rural Letters* (1882); *Three Days in Tinos* (1885); and *Tales and Reminiscences* (1886). He also conducted the publication *Hestia*, which he acquired during his residence in Germany (1886-88), where translations have been made of several of his chief productions.

DROSTE-HÜLSHOFF, drôs′te-hụls′hôf, Annette Elizabeth, Baroness von (1797-1848). A German lyric poet. She was born at Hülshoff, near Münster, passed her life largely in seclusion, and died at Meersburg, on Lake Constance. Her *Gedichte* (1838; new ed. 1895) are excellent in technique and gracefully sweet in character, particularly in their pictures of nature. In lyric and narrative forms they are well-nigh equally successful. Selections from them find place in most general collections of German verse. The posthumously printed *Das geistliche Jahr* (1852; new ed. 1883) consists largely of religious verses. Her collected works, including the *Letzte Gaben* (1860), appeared in three volumes in 1878-79. Consult Schücking, *Annette von Droste-Hülshoff* (Hanover, 1871); Busse, *Annette von Droste-Hülshoff* (Bielefeld, 1903).

DROUAIS, drōō′ȧ′. A French family of artists. Hubert (1699-1767) was best known as a portrait painter. There are two portraits by him in the Louvre—one of the painter Christophe, and the other of the sculptor Robert le Lorrain. He assisted Nattier and Van Loo in the execution of costumes and accessories. His son François Hubert (1727-75) was a painter of children's portraits. It was the fashion to be painted by François at the time of Louis XV., and he has left many examples of his art. These include Madame de Pompadour in a variety of costumes, and also Madame du Barry painted as a muse, a boy, or a sultana. The most characteristic of his pictures is "A Child Playing with a Cat" (1765). Jean Germain (1763-88) was the son of François, and the most celebrated of the family. He was born in Paris, and studied under David. In 1784 he won the Academy prize for painting, and the following year went to Rome. Three years afterwards he died in Italy. He broke away from eighteenth-century traditions, and shows distinct force and originality in his two pictures in the Louvre—"Le Christ et la Cananéenne" and "Marius à Minturnes." Both of these were painted during his stay in Rome.

DROUET, drōō′ȧ′, Henri (1829—). A French naturalist and administrator, born at Troyes. In the pursuit of his researches in natural science, he traveled throughout France examining State and private collections, and in 1857 undertook a scientific journey through Portugal. From 1858 to 1870 he was a member of the departmental administration. His publications number the following: *Enumération des mollusques terrestres et fluviatiles vivants de la France continentale* (1855); *Essai sur les mollusques terrestres et fluviatiles de la Guyane française* (1859); *Sur terre et sur mer* (1870); and *Alger et le Sahel* (1887).

DROUET, Jean Baptiste, Count d'Erlon (1765-1844). A marshal of France. He was born July 29, 1765, at Rheims, and entered the army as a private in 1782, took part in the campaigns of 1793-96, and became aide-de-camp to General Lefèvre. He distinguished himself during the sieges of Valenciennes, Le Quesnoy, and Condé, and in 1797, under Hoche, forced the surrender of the fortress of Ehrenbreitstein. His important services caused his rapid promotion, and he became brigadier-general in 1799. Made a general of division in 1800, he took an active part in the campaign of 1805-07, distinguishing himself at Jena, and being wounded at Friedland. His conduct won him the Grand Cross of the Legion of Honor and the title of Comte d'Erlon. He took a prominent part in the Peninsular War, and fought bravely against Wellington in 1814. After the fall of Napoleon he was given command of the Sixteenth Division, but was shortly afterwards arrested on the charge of conspiring against Louis XVIII. He managed to escape upon the approach of Napoleon, and putting himself at the head of the troops, he seized the citadel and held it for the Emperor, who made him a peer of France. In the Waterloo campaign Drouet commanded the First Army Corps; but, misunderstanding the Emperor's orders, wasted valuable time in a fruitless march between Ligny and Quatre-Bras. After the capitulation of Paris he fled to Bavaria, where he resided until 1825, when he returned to France. He received, in 1830, the command of the Twelfth Military District, with headquarters at Nantes, where he put down the Legitimist rising in La Vendée and arrested the Duchesse de Berry. During 1834-35 he held the important office of Governor-General of Algeria, and in 1843 was elevated to the rank of marshal. He died January 25, 1844. Consult: *Notice sur la vie militaire du maréchal Drouet, écrite par lui-même* (Paris, 1844); Sloane, *Life of Napoleon* (New York, 1896).

DROUET, Louis François Philippe (1792-1873). A celebrated French flute-player. He was born in Amsterdam, studied at the Paris Conservatory, in 1807-10 was teacher to King Louis of Holland, and in 1811 was appointed solo flutist to Napoleon I. In 1816 he appeared in London, and subsequently made extended professional tours throughout Europe. From 1836 to 1854 he was kapellmeister at the Court of Saxe-Coburg, later visited America, and latterly resided at Frankfort, Gotha, and Bern. As a performer he was remarkable for his skillful technique, particularly in double-tonguing. He wrote about one hundred and fifty works for the flute, highly valued by flute-players, but with slight content as music. It is thought, also, that he aided Queen Hortense in the arrangement of the national air, "Partant pour la Syrie" ("Departing for Syria").

DROUOT, drōō′ō′, Antoine, Count (1774-1847). A French general, born at Nancy. He fought at Fleurus (1794) and Hohenlinden (1800), and greatly distinguished himself by his skill and valor at Wagram. On the retreat from Moscow he displayed extraordinary energy and fertility of resource. One of his most brilliant exploits was performed at Hanau, where his desperate assault on the Bavarian army enabled the French to make good their retreat to the Rhine. He accompanied Napoleon to Elba as Governor of the island, and subsequently fought at Waterloo. He enjoyed wide renown as an artillerist, and his sound judgment secured for him the title of 'Sage of the Grand Army.'

DROUYN DE LHUYS, drōō′ăɴ′ de lwês′, Edouard (1805-81). A French diplomatist and politician. He was born in Paris, November 19, 1805, and received a thorough classical and legal education at the Collège Louis-le-Grand and the Ecole de Droit. In 1831 he was attached to the embassy at Madrid. In 1840 he was placed at the head of the Bureau de Commerce, under the Minister of Foreign Affairs, and in 1842 was elected Deputy from Melun; but having voted against the Government, he was deprived of his office by M. Guizot in 1845. He thereupon became a bitter opponent of the statesman and signed the act of accusation of the Guizot Ministry drawn up by Odilon Barrot, February 22, 1848. After the overthrow of Louis Philippe he was elected representative to the Constituent Assembly from the Department of Seine-et-Marne, and became president of the Committee on Foreign Affairs. In the first Cabinet formed by Louis Napoleon, after his election to the Presidency, in December, 1848, Drouyn de Lhuys became Minister of Foreign Affairs. In 1849 he went to London for a short time as ambassador, and early in 1851 again became Minister of Foreign Affairs. After the coup d'état of December 2, 1851, he became one of the vice-presidents of the Senate, and in July, 1852, he was for the third time made Minister of Foreign Affairs. Disappointed at the issue of the Vienna conferences in 1855, he resigned his office. In 1862 he was recalled, but resigned in 1866. On the fall of the Empire he fled to Jersey, but after a year returned to France and lived in retirement until his death, March 1, 1881. He was the author of a work entitled *Les neutres pendant la guerre d'Orient* (Paris, 1868). Consult: Comte d'Harcourt, *Diplomatie et diplomates: les quatre ministères de M. Drouyn de Lhuys* (Paris, 1882); also his *Mémoires*, inserted in the collections of the French Academy of Moral and Political Sciences.

DROWN, Thomas Messinger (1842-1904). An American chemist and educator. After a prolonged course of study at the best scientific schools in the United States and at two European universities, he was appointed instructor in metallurgy at Harvard, and later professor of analytical chemistry at Lafayette College. From 1885 to 1895 he held the same chair at the Massachusetts Institute of Technology. In 1895 he was called to the presidency of Lehigh University.

DROWNING. See Asphyxia; Resuscitation.

DROWNING (from *drown*, from AS. *druncnian*, Icel. *drukna*, OHG. *trunkanēn*, *drunkanēn*, to drown, from AS. *druncen*, p.p. of *drincan*, Icel. *drekka*, OHG. *trinchan*, Ger. *trinken*, to drink). A form of capital punishment once common throughout Europe, but now obsolete among the nations of Christendom, though it is still practiced in Mohammedan countries and in the far East. Tacitus, writing about the end of the first century, tells us that the Germans hanged their greater criminals, but that meaner offenders were plunged under the hurdles into bogs and fens. By the law of the ancient Burgundians, a faithless wife was to be smothered in mud. The Anglo-Saxon codes ordered women convicted of theft to be drowned. The punishment was in such common use throughout the Middle Ages that grants of capital jurisdiction ran "*cum fossa et furea*," i.e. "with pit and gallows." The pit, ditch, or well was for drowning women; but the punishment was occasionally inflicted on men, perhaps because less cruel and revolting than other forms of capital punishment, as a matter of favor. Thus, in Scotland, in 1556, a man convicted of theft and sacrilege was sentenced to be drowned "by the Queen's special grace." So late as 1611 a man was drowned at Edinburgh for stealing a lamb. By that time the punishment of drowning had become obsolete in England. It survived in Scotland until 1685. The last execution by drowning in Switzerland took place in 1652, in Austria in 1776, in Iceland in 1777. It was abolished in Russia early in the eighteenth century. See Capital Punishment;

Punishment, and the authorities there referred to.

DROYLS′DEN. A town of Lancashire, England, four miles east of Manchester (Map: England, D 3). It has important manufactures of cottons, chemicals, and extensive dye-works and print-fields. Population, in 1891, 9500; in 1901, 11,100.

DROYSEN, droi′zen, Johann Gustav (1808-84). A German historian, born at Treptow. He studied in Berlin and became privatdocent there in 1833, and professor extraordinary in 1835. In 1840 he accepted a call to the University of Kiel, and thenceforth took a prominent part in the Schleswig-Holstein dispute with Denmark as an upholder of the German claims. Sent as a representative from Kiel to the Diet of Frankfort, he was subsequently a member of the Frankfort Parliament. In 1851 he was appointed professor of history at Jena, where he founded the historical seminar, and in 1859 was called again to Berlin, where he achieved a reputation as one of the greatest German historians of the century. He died in Berlin. Of his numerous works, the following are the most important: *Geschichte Alexanders des Grossen* (Berlin, 1833); *Geschichte des Hellenismus* (Hamburg, 1836-42); *Geschichte der preussischen Politik* (14 vols., Leipzig, 1855-85); *Grundzüge der Historik* (Leipzig, 1876). For his life, consult: Duncker, *Johann Gustav Droysen* (Berlin, 1885), and a biographical sketch by Kruger in his *Outlines of the Principles of History,* trans. by E. B. Andrews (Boston, 1893).

DROZ, drô, François Xavier Joseph (1773-1850). A French moralist and historian. He served for some years in the army, but afterwards was appointed to the chair of oratory at the Ecole Centrale de Besançon. He soon attracted attention as a writer on philosophical subjects, and especially as the author of an *Essai sur l'art d'être heureux* (1801). His *Philosophie morale* (1823) gave him a place in the Academy. His greatest work is *L'histoire du règne de Louis XVI. pendant les années où l'on pouvait prévoir et diriger la révolution française* (1839-42).

DROZ, Gustave (1832-95). A minor French novelist and humorist, who catches the tone of the society of the Second Empire, toying with amiable vices, as the eighteenth century did with the pastoral virtues. His best novel is *Autour d'une source* (1869). His most successful and characteristic book, *Monsieur, Madame et Bébé* (1866), was the first to attract notice.

DROZ, Numa (1844-99). A Swiss statesman, born at La Chaux-de-Fonds. In 1864 he became editor of the radical journal *National Suisse,* and in 1871 he conducted the religious and educational interests of the Canton of Neuchâtel. After becoming a member of the Federal Council he was made Minister of the Department of the Interior in 1875, and of Commerce and Agriculture in 1879. He was elected President of the Swiss Confederation in 1881, and again in 1887. Upon the establishment of the Bureau of International Railroad Transportation, he was appointed its director (1893). His publications include: *L'instruction civique* (2d ed. 1886); *Essais économiques* (1895); and *Etudes et portraits politiques* (1895).

DROZ, Pierre Jacquet (1721-90). A Swiss mechanic. He was born at La Chaux-de-Fonds, and became famous as the improver of the mechanism of the watch and the inventor of a music-box which reproduced the tones of various instruments; of an 'automatic writer,' operated by an internal mechanism, and of various other unique devices. One of his most important inventions was a self-adjusting pendulum.

DRUDE, drōō′de, Karl Georg Oskar (1852—). A German botanist, born in Brunswick. In 1879 he became professor of botany at the Polytechnical School, Dresden, and director of the botanical garden. In addition to the monographs published in collaboration with A. Engler under the title *Die Vegetation der Erde* (Leipzig, 1896 et seq.), his publications include: *Die Florenreiche der Erde* (1884); *Handbuch der Pflanzengeographie* (1890); *Deutschlands Pflanzengeographie,* vol. i. (1895); and valuable contributions to the publications of Martius and Berghaus.

DRUG (Fr. *drogue,* from Dutch *droog,* dry; being formerly supposed to dry and cleanse the body). Any substance, whether of animal, mineral, or vegetable origin, especially in its crude or commercial form, that is used as a medicine or in the preparation and composition of medicines.

DRUG′GER, Abel. A gullible tobacconist in Jonson's *Alchemist,* who consults Subtle, the alchemist, in the building and arrangement of his shop in order to insure good luck. The part was a favorite rôle of Garrick.

DRUGGET (Fr. *drouget,* of unknown etymology). A common felt or other coarse woolen fabric, often printed on one side, and chiefly used for covering carpets, or as a substitute for a carpet.

DRUID (Lat. *druida,* Gk. δρυίδης, *dryides,* from OIr. *drui,* nom. pl. *druad,* Gael. *draoi,* connected with OIr. *dair, daur,* oak, Gk. δρῦς, *drys,* tree, OChurch Slav. *drŭva,* Skt. *dāru,* wood). One of the fraternity of priests, religious teachers, and judges who ruled over the Celtic inhabitants of ancient Gaul and perhaps of Britain. The institution of Druidism was probably common to all Celtic nations; but we have detailed accounts of the form only under which it existed in Gaul. Cæsar gives the following description of the character and functions of the Druids: "They attend to divine worship, perform public and private sacrifices, and expound matters of religion. A great number of youths are gathered round them for the sake of education, and they enjoy the highest honor in that nation. Nearly all public and private quarrels come under their jurisdiction; and when any crime has been committed, as when a murder has been perpetrated, or when a controversy arises about a legacy, or about landmarks, they are the judges too. They fix rewards and punishments; and should any one, whether a private individual or a public officer, disobey their decrees, then they exclude him from the sacrifices. This is with them the severest punishment. The persons who are thus laid under interdict are regarded as impious and wicked people; everybody recoils from them and shuns their society and conversation, lest he should be injured by associating with them. They cannot obtain legal redress when they ask for it, nor are they admitted to any honorable office. . . .

At a certain time of the year the Druids assemble in the territory of the Carnutes, which is believed to be the centre of all Gaul, in a sacred place. To that spot are gathered from everywhere all persons that have quarrels, and they abide by their judgments and decrees. It is believed that this institution was invented in Britannia, and thence transplanted into Gaul. Even nowadays those who wish to become more intimately acquainted with the institution generally go to Britannia for instruction's sake.

"The Druids take no part in warfare; nor do they pay any taxes like the rest of the people; they are exempt from military service and from all public burdens. Attracted by such rewards, many come to be instructed of their own choice, while others are sent by their parents. They are reported to learn in the school a great number of verses, so that some remain there twenty years. They think it an unhallowed thing to commit their lore to writing, though in the other public and private affairs of life they frequently make use of the Greek alphabet. . . . Beyond all things they are desirous to inspire a belief that men's souls do not perish, but transmigrate after death from one individual to another; and they hold that people are thereby most strongly urged to bravery, as the fear of death is thus destroyed."

This powerful priesthood did all they could to uphold the national cause against the Roman conquerors, and urged the people to rebellion. The Emperor Claudius found it necessary to interdict formally the practice of druidical rites, which seem, however, to have continued down to the extinction of paganism. Besides being priests and teachers of religion, the Druids appear to have been adepts in the magic arts, and were versed in the mysterious powers of animals and plants. The oak-tree was especially sacred among the Druids, and they frequently performed their rites in oak groves. They also had a special reverence for mistletoe when growing on an oak. According to the elder Pliny, a Druid, clothed in white, mounted the tree, and with a knife of gold cut the mistletoe, which was received by another standing on the ground, on a spotless cloth. The same author gives a curious account of the 'serpent's egg' worn as a distinguishing badge by the Druids. It was formed, he says, by the poisonous spittle of a great many serpents twined together. Gathered at moonlight, and afterwards worn in the bosom, it was a mighty talisman. All these particulars refer properly to the Druids of Gaul, but the Druidism of Britain was essentially the same.

In all the countries anciently inhabited by Celts, there are found rude structures of stone, one of the most common forms of which is the so-called *dolman* (q.v.). The older archæologists assumed that these were druidical altars; but there is no proof that such was their purpose or origin. Similar structures are found in Scandinavia and Germany, and to assume in all these countries the presence of Celts seems too hazardous. The same doubts prevail as to the supposed druidical temples of Avebury, of Carnac in Cæsar, *De Bello Gallico*, vi. 13, 14; Ramsay, Brittany, and of Stonehenge (q.v.). Consult *Foundations of England*, vol. i. (London, 1894); d'Arbois Jubainville, *Introduction à l'étude de la littérature celtique* (Paris, 1883); id., *Les Druides et les dieux celtiques à forme d'animaux* (ib., 1906); Bonwick, *Irish Druids and Old Irish Religions* (London, 1894); Rhys, *Lectures on the Origin and Growth of Religion as Illustrated by Celtic Heathendom* (London, 1888). See CELTIC PEOPLES.

DRUIDS, ORDER OF. A secret organization for purposes of mutual aid and protection, established in London in 1781, introduced in the city of New York in 1833, and in Germany in 1872. In England a number of independent lodges sprang from the parent organization; in the United States the Order assumed a more national character, the first grand grove (the name lodge was discontinued) having been established in 1849. The society included, in 1902, 16 grand groves and 406 sub-groves, with a total membership of 17,354; in the same year it had paid out in benefits some $5,000,000. Many of the members of the organization are German or of German descent.

DRUM (Dutch *trom*, Ger. *Trommel*, dial. *dromm*, from OHG. *trumba*, *trumpa*, trumpet, It. *tromba*, Fr. *trompe*, Eng. *trump;* connected ultimately with Lat. *triumphus*, triumph, Gk. *θρίαμβος*, *thriambos*, Bacchic procession). A musical instrument of percussion, consisting of a cylinder of wood or brass over one or both ends of which a membrane is stretched tightly by means of wooden hoops. There are four kinds of drums—the side drum, only differing from the snare-drum (q.v.) in the absence of gut strings across its under side; the bass-drum (q.v.), and the kettle-drum (q.v.). With the exception of the last, drums cannot be perfectly tuned, and hence are of use only to mark or vary the rhythm. Drums of various forms were early used in Egypt and India. An Egyptian instrument corresponding to the modern African tom-tom can be traced back to about B.C. 1600. The *tympanum* of the Greeks and Romans resembled a small modern kettle-drum, though it could not be tuned to any exact pitch. From India the use of drums spread westward, being introduced into Europe either by the Moors or through the Crusades. See MUSICAL INSTRUMENTS.

DRUM, or DRUMFISH (so called from the drumming noise). Any of several fishes of the family Sciænidæ, most of the species of which make a noise under water variously called croaking, drumming, snoring, grunting, etc., but which most resembles the roll of a muffled or distant drum. This noise is commonly thought to be produced by the transfer of air to different compartments of the air-bladder. The fishermen frequently attribute it to the rubbing together of the broad pharyngeal teeth, which are arranged like a cobblestone pavement, and are often preserved as a seashore curiosity. These remarks more particularly apply to the salt-water drum of the Atlantic coast of the United States (*Pogonias chromis*), which has been known to exceed 100 pounds in weight, but ordinarily is not half that weight. It is a heavily built fish, with poor flesh, large scales arranged in diagonal rows, and a large number of short barbels hanging from the lower jaw. It frequents bays and shallow coastal waters, in search of the mollusks upon which it mainly feeds, and may often be heard at night 'drumming' steadily for a long time beneath an anchored boat. It is a great pest to the oyster-planters about New York, destroying annually a vast amount of cultivated oysters, the fish crushing into fragments hundreds more than it eats. (Consult, on this point, Ingersoll, "The Oyster Industry," in *United States Tenth Census Report*, Washington, 1881.) This species ranges on the east coast south to Uruguay. The southern variety (*Pogonia curbina*) is known by the Brazilians as 'curbina,' meaning 'croaker.' The fresh-water or river drum (*Aplidonotus grunniens*), also known as thunderpumper, sheepshead, and croaker, is a kindred fish common in the lakes and streams of the Mississippi Valley. In the North it is not much valued, but in the South it holds a high rank as a food-fish. Other species of drum are the red drum (*Sciænops ocellatus*) of the South Atlantic and Gulf States, and the black drums of the genus Sciæna, mostly of the Old World. Most of the species afford good sport with the line.

DRUMCLOG, drum-klŏg′ (Gael., ridge of stone). A tract of moorland in Lanarkshire, Scotland, famous as the place where 200 Cameronians defeated Claverhouse on June 11, 1679 (Map: Scotland, D 4). An obelisk commemorates the victory. The battle is graphically described in Scott's *Old Mortality*.

DRUM′LIN (from Ir., Gael. *druim*, drum. ridge). A smoothly arched oval hill rarely more than 150 feet high or more than half a mile long, usually occurring on the flat lowlands, and looking somewhat like a sand-dune, but made of coarser materials and covered with thin soil and vegetation. Drumlins are composed of till, as it is called in Scotland, or the hard-pan or boulder clay of northern New England, that has been heaped up by the pressure of overlying glaciers. Drumlins occur in all glaciated districts, and their existence in New England, New York, and the lake region of North America indicates that all of that country has been once covered with glaciers, or rather with a single continuous glacial covering. Drumlins are found over all that portion of North America, Europe, and Asia that lies north of the terminal moraine of the Continental glacier. See GLACIER; GLACIAL PERIOD.

DRUM MAJOR. The non-commissioned officer in charge of a drum corps. In the United States Army he is appointed by the regimental commanders, upon the recommendation of regimental adjutants. He ranks with first sergeants, receiving pay at the rate of from $25 to $30 per month according to length of service.

DRUMMER. In the United States Army enlisted men are appointed and trained to act as drummers. They rank as privates, and with the fifers collectively constitute the regimental field music or drum corps. There is one fifer and one drummer to each company. In the British Army they act as buglers in the daily routine of barrack and camp life, announcing by bugle or drum the various duties of the day.

DRUM′MOND, GEORGE. See PERTH, EARL OF.

DRUMMOND, Sir GORDON (1772-1854). A British soldier, born in Quebec. He entered the army as an ensign in the Royal Scots in 1789, was rapidly promoted, and in 1794 attained the rank of lieutenant-colonel of the King's Liverpool Regiment, which he commanded in several campaigns on the Continent, particularly distinguishing himself at the battle of Nimeguen. He served in the Egyptian campaigns of 1800-01, commanded a division in Jamaica from 1805 to 1807, and in 1810, with the rank of lieutenant-general, became second in command to Sir George Prevost, commander of the forces in Canada. He took part in the American war of 1812, commanding the British at the indecisive battle of Lundy's Lane, or Bridgewater, on July 25, 1814; and remained in Canada as commander-in-chief of the British forces after the close of the war, until 1816. He was promoted to the rank of general in 1825.

DRUMMOND, HENRY (1851-97). An English author and evangelist, born in Stirling, Scotland. From the high school of Stirling and a boarding school in Crieff, he passed to the University of Edinburgh (1866). Four years later he began his preparation for the ministry at New College, Edinburgh. Stirred by the preaching of Moody, he engaged in active mission work (1873-75); in 1877 he was appointed lecturer on natural science in the Free Church College, Glasgow; and in 1884 became professor of theology. He now began missionary work among college students with very great success. The religious movement he initiated spread throughout the English-speaking world; and he was called to America and Australia. In the interest of science, he also made expeditions to the Rocky Mountains and to South Africa. The aim of Drummond was to reconcile science and religion. To this end he wrote *Natural Law in the Spiritual World* (1883), and *The Ascent of Man* (1894). He also published *Tropical Africa* (1888); *Travel Sketches* (1890), and other books and addresses, among which is *The Greatest Thing in the World* (1890). Drummond's books were widely read and made a deep impression. For his *Life*, consult George Adam Smith (London, 1902); Lennox (New York, 1901); Simpson (New York, 1901).

DRUMMOND, THOMAS (1797-1840). A Scottish engineer. In 1820 he was engaged by Colonel Colby to assist in the trigonometrical survey of the United Kingdom. The incandescence of lime having been brought under his notice at a lecture on chemistry, the idea occurred to him that it might be advantageously used on the survey to render distant objects visible. He accordingly made experiments, which resulted in the introduction of the lime-light (Drummond light, q.v.). A heliostat (q.v.) of his invention has also been extensively used. He was head of the commission appointed to readjust the borough boundaries under the provisions of the Reform Bill of 1832, and in 1835 became Under Secretary for Ireland.

DRUMMOND, WILLIAM (1585-1649). A Scottish poet, descended from a very ancient and noble family, and born at the family seat, Hawthornden, near Edinburgh. He was educated at the high school of Edinburgh, and at the university of that city, where he took his degree of A.M. in 1605. During 1607-08 he was on the Continent, attending law lectures in Bourges and Paris. He returned in 1609, and in the following year went to Hawthornden, which, according to the learned Ruddiman, "was a sweet and solitary seat, and very fit and proper for the muses," and there spent his life in his favorite literary pursuits. Drummond enjoyed the friendship of many literary men, and the record of a famous visit of Ben Jonson to Hawthornden, in the winter of 1618-19, has been preserved in Drummond's *Notes of Ben Jonson's*

Conversation with William Drummond. His verse, written in the standard English dialect, comprises an elegy on the death of Prince Henry, son of James I., entitled *Tears on the Death of Meliades* (1613); *Poems* (1616), in which are some of his choicest pieces; and *Forth Feasting* (1617), in honor of James I.'s visit to Scotland. Drummond had a rare command over difficult metres, and many of his sonnets and madrigals are very beautiful. *A Cypress Grove* (1623), an essay on death, is a remarkable piece of prose. He also wrote political tracts, and a history of Scotland from 1424 to 1542. His *Poems*, edited, with memoir, by Ward, were published in two volumes (London, 1894). For his *Life*, consult Masson (London, 1873).

DRUMMOND, Sir William (1770?-1828). An English diplomat and scholar. In 1796 and 1801 he was a member of Parliament, and at different times was sent on diplomatic missions to Naples and Constantinople. He published *A Review of the Government of Sparta and Athens* (1795); *Origines or Remarks on the Origin of Several Empires, States, and Cities* (1824-29); and the *Œdipus Judaicus* (1811).

DRUMMOND ISLAND. An island forming a part of Chippewa County, Michigan (Map: Michigan, K 3). It lies in Lake Huron, and is the most westerly of the Manitoulin group, being about 30 miles east of Mackinaw. It is 20 miles long, and 10 miles wide at the widest place.

DRUMMOND LIGHT, Calcium Light, or Lime-Light. The intense brilliant light that is produced when an oxyhydrogen flame is directed against lime. The light was invented by Capt. Thomas Drummond (q.v.). In the production of the light, minute portions of the lime become volatilized by the intense heat. The cylinder of lime must, therefore, be kept slowly rotating by means of a clockwork, so that a new surface may be continually presented to the flame. Ordinary illuminating gas is often substituted for the hydrogen, the oxygen being supplied to the gas-flame in a highly compressed state. Magnesia, zirconia, and other earths have the similar property of becoming incandescent when heated. The Drummond light, and the light obtained by strongly heating other metallic oxides than that of calcium, are employed in magic lanterns, in photography, etc.

DRUMONT, drụ′mōɴ′, Edouard Adolphe (1844—). A French anti-Semitic agitator and journalist, born at Paris. He was at first in the government service but later became a contributor to the press and was the author of a number of miscellaneous works, of which *Mon vieux Paris* (1879) was crowned by the Academy. In 1886 he began a violent campaign against the Jews in his book *LaFrance juive*. This was followed by *Fin d'un monde* (1888), *Dernière battaile* (1890), *Testament d'un antisémite* (1891, *Secret de fourmies* (1892), *De l'or de la boue du sang* (1896), dealing with the Panama scandals, and *Les Juifs et l'affaire Dreyfus* (1899). In 1892 he founded the *Libre Parole* as an organ for his views. From 1898 to 1902 he represented Algiers in the Chamber of Deputies.

DRUNKENNESS (AS. *druncenness*, from *druncen*, p.p. of *drincan*, Icel. *drekka*, Goth. *drigkan*, OHG, *trinchan*, Ger. *trinken*, to drink). The mental and physical condition resulting from excessive drinking of intoxicating liquors. Its effect upon the contractual capacity of its victim is the same as that of insanity. In Lord Coke's time it was no ground for avoiding a contract. "As for a drunkard," he declares, "who is *voluntarius dœmon*, he hath no privilege thereby." It is now settled, in accordance with the dictates of good sense and common justice, that a contract made by a person so destitute of reason as not to know the consequences of his agreement, though his incompetency be produced by voluntary drunkenness, is voidable at his option.

Drunkenness can rarely be pleaded as a defense in an action of tort (q.v.). In the United States there is judicial authority, however, for the admission of this plea when the tort complained of involves a special intent on the part of the defendant. Civil misconduct of that sort does not often come before the courts, and in the great majority of tort actions, such as those for assault and battery, for defamation, for negligence, and for trespass to land, the drunkenness of the wrongdoer has been held not a legitimate defense.

In criminal law the general rule is well settled that drunkenness is not a justification or excuse for crime. To hold otherwise would be dangerous to and subversive of the public welfare. Still, when an essential ingredient of the crime with which a prisoner is charged is the doing an act with a specific intent—as in entering a house by night with intent to commit larceny, or in assaulting a female with intent forcibly to ravish—the drunkenness of the actor may be taken into account by the jury in determining whether he acted with that specific intent. If the jury believe that he was so drunk as to be incapable of forming such specific intent, they should acquit him of the offense charged.

In itself drunkenness is not a legal offense, though drunken conduct in public may be a nuisance, and is often made a statutory offense, punishable by arrest, fine, and imprisonment.

When habitual it may also render the drunkard liable to a judicial inquisition, followed by the appointment of a committee or trustees to take the guardianship of him and his property. (See Insanity; Lunacy.) Consult: Kent, *Commentaries on American Law;* Pollock, *Principles of Contract in Law and in Equity* (2d American ed., G. H. Wald, editor, Cincinnati, 1885); Bishop, *Commentaries on Non-Contract Law* (Boston, 1889); Woodruff, *Cases on Domestic Relations and the Law of Persons*, part v. (New York, 1897). See Alcohol, Physiological and Poisonous Action of; Alcoholism; Dipsomania; Intoxication; Temperance.

DRUNKEN PARLIAMENT, The. A name given to the Scottish Parliament of 1661, the members of which were accused of constant drunkenness. By one act it annulled the acts of the Parliaments preceding it for twenty-eight years, and brought about the upheaval of the whole Scotch Church system.

DRUPE (Fr., from Lat. *drupa*, Gk. *δρύππα*, *dryppa*, overripe olive, from *δρυπεπής*, *drypepēs*, ripened on the tree, from *δρῦς*, *drys*, tree + *πέπτειν*, *peptein*, to cook, or *δρυπετής*, *drypetēs*, fallen from the tree, from *δρῦς*, *drys*, tree + *πίπτειν*, *piptein*, to fall). A stone-fruit, in which the ovary wall, in forming the pericarp, develops an outer fleshy layer and an inner stony or bony layer, as in the peach, plum, cherry, etc. See FRUIT. For illustration, see Plate of DRUPES.

DRUPELET. A small drupe, as the individual 'grains' of a blackberry, raspberry, etc. See FRUIT.

DRU'RY, DRU (1725-1803). An English entomologist, born in London. His *Illustrations of Exotic Entomology* (2 vols., 1773-82) is a work containing much valuable material and illustrated with a large number of beautiful figures. Beside this, he wrote several other works and gathered a remarkably fine collection of insects.

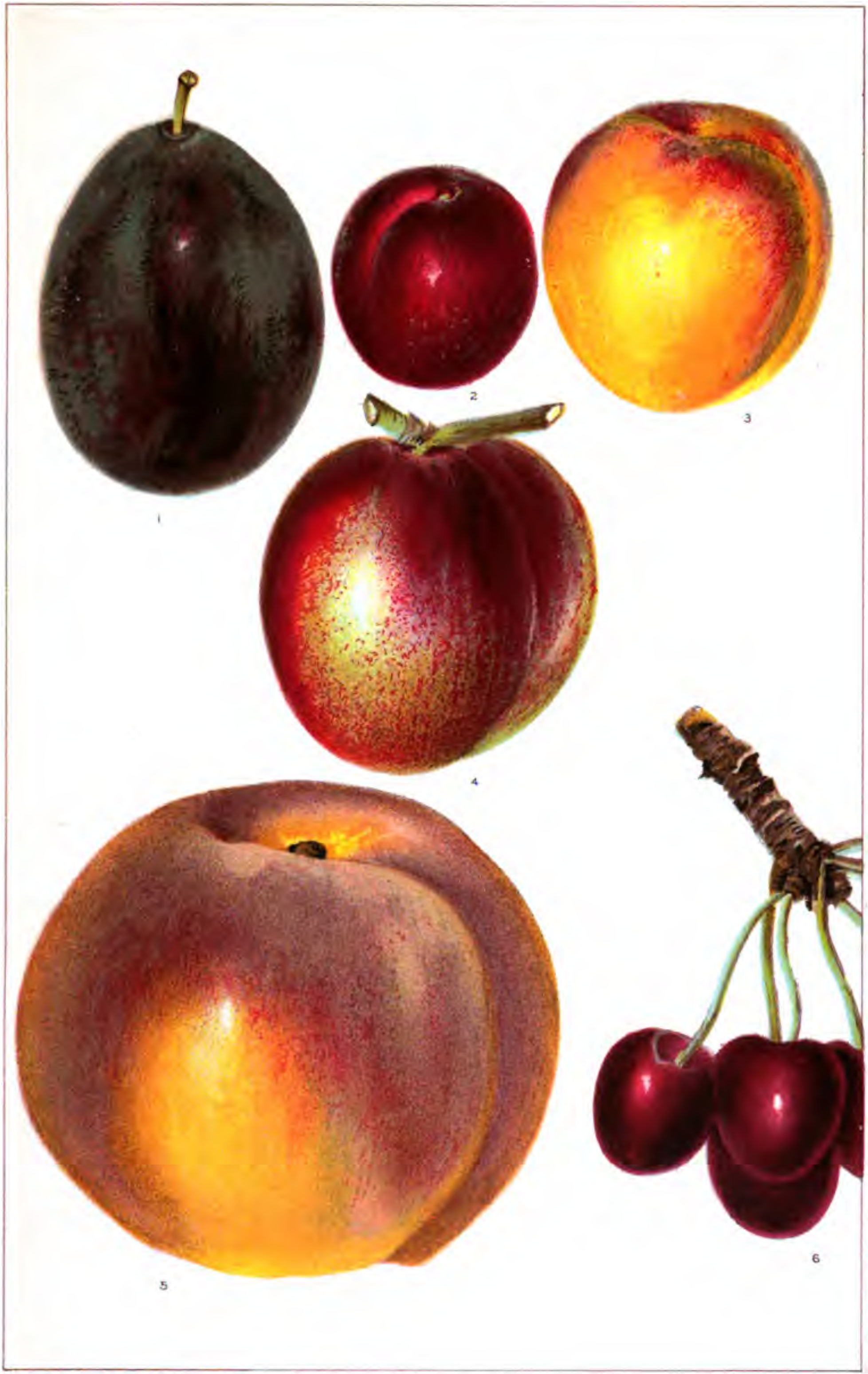
DRURY LANE. A street in London, leading from the Strand to Oxford Street and the British Museum. It was named after Sir William Drury's house, which during the reign of Henry VIII. stood where the entrance from the Strand is now. It was a fashionable quarter under the Stuarts, but in Queen Anne's time its respectability had begun to decline.

DRURY LANE THEATRE. A famous London playhouse. It was first built, under royal patent, in 1663, by Thomas Killigrew (q.v.), whose company was known as the King's Company, in distinction from the Duke's Company of Davenant (q.v.). The house was originally called the Theatre Royal. Burned in 1672, it was rebuilt in 1674 from designs by Sir Christopher Wren. In the years that followed, rivalry between the two companies was so ill-sustained that in 1682 they were united. A dozen years later, however, Betterton (q.v.) and others of the company made their well-known secession to Lincoln's Inn Fields, and in 1709 continued bad management brought the theatre to a close. Colley Cibber and his associates renewed its prosperity, and Garrick's management, which followed (1746-76), was perhaps the most famous in its history, with 'Peg' Woffington and 'Kitty' Clive as leading stars. In 1791 the old building made way for a new structure which was opened three years later and managed by Sheridan. In 1809 this again was destroyed by fire, and in 1812 the present house was opened. The acting of Kean gave it prosperity for a time, but since his day Drury Lane and its managers have suffered numerous vicissitudes. In recent years it has been devoted largely to spectacular pieces and English opera. Consult: Stirling, *Old Drury Lane* (London, 1881), and Doran, *In and About Drury Lane* (London, 1881).

DRURY'S BLUFF, BATTLE OF. See BERMUDA HUNDRED.

DRUSES, dro͞oz'ez. A people of mixed origin, who inhabit a district in Syria, comprising the southern portion of the Lebanon and the western slope of Anti-Lebanon, as well as a large portion of the region of the Hauran. In the first-mentioned district they hold exclusive possession of about 40 towns and villages, and divide the possession of about 200 more with the Maronites (q.v.), while 80 villages in other parts of Anti-Lebanon are peopled by them. They number about 90,000, and are probably derived from Kurdish, Persian, and Arab stock. Their religion is fundamentally Mohammedan, but of a peculiar type, which they adhere to with stern fanaticism. Early in the eleventh century Hakem, the Fatimite Caliph of Egypt, a cruel tyrant hated by his people, caused the incarnation of God in himself to be publicly preached in Cairo by his confessor, Darasi, who thereby brought upon himself the active hatred of the people. He escaped to the Lebanon, where he was received by the mountaineers and taught his new religion. From him the name Druses is probably derived. It was, however, by Hamze, a Persian disciple of Hakem, that the faith was given the form in which the Druses hold it. The Druses have maintained their religious and political independence for nearly nine centuries. Their faith mingles the teachings of the Mosaic law, the Christian Gospels, the Koran, and the Sufi allegories. Their seven cardinal principles are: (1) veracity in dealings with each other; (2) mutual protection and resistance; (3) renunciation of other religions; (4) belief in the divine incarnation in Hakem; (5) contentment with the works of God; (6) submission to His will; (7) separation from those in error and from demons. They believe in one God who has revealed Himself ten times upon earth as mortal man, the incarnation in Hakem being the tenth and last. They believe in the transmigration of souls, with constant advancement and final purification. Their teachings enjoin abstinence from wine and tobacco, from profanity and obscenity. They are divided into the Akals, or initiated, and the Djahils, the ignorant. The latter are free from all religious duties. Between 1840 and 1860 there was bitter strife between the Druses and their immediate neighbors, the Maronite Christians. Owing to the shocking barbarities perpetrated by the Druses in 1860, the European powers undertook to intervene in defense of the Christians. A French army was dispatched to Syria in August and a commission of the powers was appointed to investigate the facts. The Druses escaped into the Hauran desert, and it was found that Turks and Damascene fanatics were really responsible for stirring up the strife in which the Maronites had acted with a vindictiveness equal to that of the Druses. Punishment was meted out to the Mohammedans who were principally responsible, and among others Achmet Pasha, the Governor of Damascus, was shot. In June, 1861, the troops returned to France, and the commissioners drew up a scheme of government for the Lebanon. It provided for a Christian governor, appointed by the Porte, and the division of the region into seven districts, under chiefs of the religion prevailing in each. Fuad Pasha, an Armenian Christian, was the first governor, and the district chiefs included four Maronites, one Druse, one orthodox Greek, and one separatist Greek. The Constitution did not satisfy the Maronites, whose revolt, under Joseph Karan, kept the Lebanon in a very unsettled state till 1867. During this period the governor had to restrain the Druses from attacking the Maronite villages. They had no superior educational establishment until Fuad Pasha founded and endowed one at Abeih. Polygamy is unknown among them. They possess an extensive theological literature. They have, with incredible toil, carried the soil of the valleys up and along the hillsides, which are laid out in terraces, planted with mulberry, olive, and vine. Their chief trade is the manufacture of silk. Corn is raised, though in very small quantities. Deirel-Kamar is the principal town. Consult: Earl of Carnarvon,

DRUPES



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

1 BRADSHAW PLUM (EUROPEAN TYPE) NATURAL SIZE
2 MINER PLUM (NATIVE ") " "
3 ROYAL APRICOT " "
4 BOSTON NECTARINE NATURAL SIZE
5 CHAIRS CHOICE PEACH " "
6 TARTARIAN CHERRY " "

Druses of the Lebanon (London, 1860); Churchill, *Ten Years' Residence in Mount Lebanon* (London, 1853); id., *The Druses and Maronites Under Turkish Rule from 1840 to 1860* (London, 1862); Guys, *La nation druse* (Paris, 1864); id., *La théogonie des Druses* (Paris, 1863); Oliphant, *Land of Gilead* (London, 1880); id., *Haifa* (London, 1887).

DRUSIL'LA. (1) The daughter of Germanicus and Agrippina, born in A.D. 15. She lived with her brother Caligula as his mistress until her death in A.D. 38. (2) The daughter of Herod Agrippa I., King of Judea. She married Azizus, King of Emesa, but forsook him and married Antoninus Felix, who became Governor of Judea, and before whom Saint Paul appeared at Cæsarea.

DRUSIUS, drōō'sĭ-ŭs, JOHANNES (JAN VAN DER DRIESCHE) (1550-1616). A Flemish Protestant clergyman and scholar, born at Oudenarde. He studied at Ghent, Louvain, and Cambridge, and in 1572 was appointed professor of Oriental languages at Oxford. In 1577 he obtained a similar chair at Leyden, and from 1585 until his death held the professorship of Hebrew at the University of Franeker. His fame attracted thither students from England and the Protestant countries of the Continent. He was employed by the States-General to annotate the Old Testament, and his edition is to be found in the *Critici Sacri* (London, 1660; Amsterdam, 1698). His reputation for Hebrew scholarship is justified by his published works. Consult: Nicéron, *Mémoires des hommes*, vol. xxii. (Paris, 1733), and Diestel, *Geschichte des alten Testaments in der christlichen Kirche* (Jena, 1869).

DRU'SUS. The name of a distinguished family of the gens Livia, which contributed a large proportion of eminent men to the Roman commonwealth. The most conspicuous of the Drusi were: (1) M. LIVIUS DRUSUS, tribune of the people in B.C. 122, who upheld the cause of the Senate and the nobles against his democratic colleague, Gaius Gracchus. (2) His son, who bore the same name as himself, and kept Rome in perpetual turmoil and disorder from B.C. 100 till his death in B.C. 91. Though identified by birth and sympathy with the patricians, Drusus, to win the people, revived some of the most liberal measures of the Gracchi, and carried agrarian and frumentarian laws. During the latter years of his life he contrived to gather into his own hands the threads of the various political movements which resulted in the Social War; but his almost incredible pride and arrogance had made him so many enemies that his death, in the flower of his age, was regretted as little by his friends as by his foes. (3) The most illustrious of the Drusi was Nero Claudius Drusus, commonly called Drusus Senior, the stepson of the Emperor Augustus, and younger brother of the Emperor Tiberius. He was born in B.C. 38, and as he grew up, developed splendid personal qualities as well as the highest capacity for civil and military affairs. He began his public career in B.C. 19, and signalized himself when only twenty-three years old by his defeat of the Rhætians and other Alpine tribes which were disturbing the north of Italy. In B.C. 13 he was sent into Gaul, then in revolt, and, after crushing the rebels there, pushed across the Rhine in pursuit of their German allies. In this campaign he subdued the Sigambri and Frisii, and forced his way to the German Ocean, being the first Roman general to do so. From this time he strove to establish the Roman supremacy in Germany, partly by conquest, and partly by the execution of great military works. Among these latter may be mentioned the canal joining the Rhine with the Yssel, the two bridges over the Rhine itself, and the embankments of the Vahalis (Waal). In B.C. 11 he conquered the Usipetes, the Cherusci, and the Suevi; in the following year, the Chatti and Nervii; and was prosecuting the work of subjugation in B.C. 9, when a fall from his horse cut short his brilliant career in his thirtieth year. For his exploits in Germany, Drusus was rewarded with the title of Germanicus, a surname which passed over to his celebrated son. See GERMANICUS.

DRUSUS, ARCH OF. A travertine arch coated with marble over the Appian Way in Rome, said to have been erected in honor of Claudius Drusus. In reality it is simply an arch of the aqueduct built by Caracalla to supply his baths.

DRUSUS CÆ'SAR, usually called DRUSUS JUNIOR (?-A.D. 23). The son of the Emperor Tiberius by his first wife. He was made quæstor in A.D. 10, and consul in A.D. 15, but degraded the office by his excesses, and his father sent him with the army to Illyria. In A.D. 22 he received the *tribunicia potestas*, and was looked upon as heir to the throne. Deeming Sejanus to be his rival, Drusus struck him in the face; whereupon Sejanus, in revenge, deliberately won the affections of Livia, Drusus's wife, and together they caused the death of Drusus by poison.

DRY'ADS (Lat. *dryas*, from Gk. δρυάς, *dryas*, wood-nymph, from δρῦς, *drys*, tree, oak), or HAMADRYADS. The nymphs of the trees and forests. According to the popular belief each tree (or, at any rate, each large or conspicuous tree) had its own dryad, who came into life with it, tenderly watched its growth, and died when it fell. The dryad was sometimes conceived as dwelling in her tree, sometimes as merely living near it. The name dryad is also employed in a general sense for nymphs who merely dwell in the forest, without association with particular trees. See NYMPHS.

DRYANDER, drụ-ăn'dẽr, ERNST (1843—). A German Protestant theologian, born in Halle. He was educated at the universities of Halle and Tübingen; from 1874 to 1882 was pastor of the Evangelical congregation in Bonn, and in the latter year became pastor of the Church of the Holy Trinity in Berlin, where he quickly became known for his pulpit eloquence. In 1898 he was appointed Court preacher, and in 1901 a life member of the Upper House of Prussia. His publications include *Predigten über das christliche Leben* (3d ed. 1890), and *Der erste Brief Johannis in Predigten ausgelegt* (1898).

DRYANDER, FRANZ. See ENZINAS.

DRY'ASDUST, REV. DR. The imaginary person who signs the introductory epistles to several of Scott's novels and the conclusion to *Redgauntlet*. The name is used as a synonym for a prosy writer, and has become famous through Carlyle.

DRY'BURGH ABBEY. An impressive ruin near Melrose, Scotland, which contains the tomb of Sir Walter Scott. It is an admirable example of the Norman and Early English styles of architecture.

DRY'DEN. A village in Tompkins County, N. Y., 36 miles south-southeast of Auburn, on the Lehigh Valley Railroad (Map: New York, D 3). It has large woolen mills. Sulphur springs and a healthful and attractive situation make the village a popular resort. The Southworth Library is a public institution. Dryden Township includes the village of Freeville, where is located the George Junior Republic (q.v.). Population, 1900, 699; 1905, 749.

DRYDEN, JOHN (1631-1700). An English dramatist, poet, and critic, born at Aldwinkle, a village of Northamptonshire. His father, Erasmus Driden, was the third son of Sir Erasmus Driden, baronet. Dryden received the rudiments of his education at Tichmarsh, and was afterwards admitted to a scholarship at Westminster School, under Dr. Busby. In 1649 he contributed an elegy to the *Tears of the Muses*, a collection of thirty-three poems on the death of Henry, Lord Hastings. The poem, written in the 'metaphysical' style, was a poor performance even for a schoolboy. In May, 1650, he was elected to a scholarship in Trinity College, Cambridge, where he wrote, the same year, a few commendatory verses to the *Sion and Parnassus* of John Hoddesdon; he graduated B.A. in 1654. His father died in 1654, and left him a small estate estimated at £60 a year, of which sum his mother had life interest in a third. It is thought that he remained at Cambridge till 1657, and then took up his residence in London. Like the rest of his family, he was an adherent of Cromwell. In 1658 he published his first poem of importance, entitled "Heroic Stanzas to the Memory of Oliver Cromwell." The restoration of Charles II. he celebrated in two poems *Astræa Redux* (1660) and *Panegyric on the Coronation* (1661). There is no good reason for doubting the sincerity of Dryden in these poems. His was the joyful voice of the English people on the return of their King. In December, 1663, Dryden married Lady Elizabeth Howard, sister of Sir Robert Howard. He had already begun his career as dramatist, his first play, the *Wild Gallant*, having been performed at the King's Theatre in February, 1663. During the next twenty years he produced many successful plays, although the comedies are coarse, and the tragedies stiff. The best is *All for Love*, founded on Shakespeare's *Antony and Cleopatra*, written in blank verse, while his other tragedies are in heroic couplets. In the meantime he had produced *Annus Mirabilis* (1667), the subject of which is the Dutch war and the fire in London. In 1670 he was appointed poet-laureate and historiographer with a salary of £200 a year. In 1671 the Duke of Buckingham produced a famous attack on the English heroic drama, of which Dryden was the head. This satirical piece was entitled *The Rehearsal*, and when it was brought on the stage the town was amused. Although personally satirized, Dryden endured his castigation in silence, and, awaiting his opportunity, immortally revenged himself on the witty and profligate Duke in *Absalom and Achitophel* (first part, 1681). This magnificent satire arose out of the political commotions of the times, and is an elaborate defense of the King against the Whig Party. Charles II. is David; Monmouth, Absalom; Cromwell, Saul; Buckingham, Zimri; and Shaftesbury, Achitophel. Its success was amazing. The next year appeared *The Medal, Mac Flecknoe,* and the second part of *Absalom and Achitophel* (written in collaboration with Nahum Tate). His enemies now crushed, Dryden became the undisputed king and lawgiver of English literature in his day. In 1682 he stated and maintained the doctrines of the Church of England in a poem entitled *Religio Laici*.

After the death of Charles II., Dryden became a convert to the Roman Catholic faith. This event was announced by the publication of *The Hind and Panther* (1687). For this change of faith he has been much abused. Macaulay calls him 'an illustrious renegade.' Others strenuously defend his sincerity. At the Revolution he was deprived of his laureateship, and, somewhat straitened in circumstances, he turned again to the stage. His translation of Vergil, begun in 1694, was published in 1697. To the same year belongs his best lyric, the *Ode on Saint Cecilia's Day*, often called *Alexander's Feast*. In 1699 he published, under the title of *Fables*, versions of Ovid, Boccaccio, and Chaucer, to which was added one of his great prefaces. He was buried in Westminster Abbey.

Although the great bulk of Dryden's work consists of plays which are, for the most part, devoid of character, feeble in sentiment, false to nature, and exaggerated in expression, he must always remain a prominent figure in English literature. His *Satires* are masterpieces. In these he is masculine and natural, and his versification flows on, broad, deep, and majestic. Nor is it only as a poet that he excels; his prefaces and *Essay on Dramatic Poesy* prove him to be a master of 'that other harmony of prose.' His *Complete Works* were edited, with a *Life*, by Walter Scott in eighteen volumes (Edinburgh, 1808; reprinted 1821, and revised by Saintsbury, 1882-93); the *Poetical Works* were edited, with a *Life*, by Christie (London, 1870); and a critical edition of *Essays*, edited by Ker, was published in Oxford in 1900. Consult, also: Garnett, *Age of Dryden* (London, 1895); and for his biography, Saintsbury (London, 1881).

DRY DOCK. See DOCK.

DRY GANGRENE, găŋ-grēn'. See ERGOTISM.

DRYING MACHINES. Devices for the speedy drying of textile materials. The machine commonly used consists of two drums or cylinders open at the top; the inner one, into which the goods are packed, is perforated at its sides, and made to revolve with great velocity. The use of the outer cylinder is merely to catch the drops of water thrown out by centrifugal force as the wet clothes are rapidly revolved. The drying is not, however, quite completed by such machines, and the remaining moisture is removed by open air or hot-chamber drying or by passing over heated cylinders. These drying machines are commonly called "extractors" or "centrifugal wringers." A simpler drying machine, called a wringer, consists of two rollers mounted parallel, and one above the other, with an adjustment to vary the distances between them. One end of the article to be dried is inserted between the rollers, which are then brought as close as possible together, and one roller is turned by a handle; the other, being free to revolve, turns also as the clothes pass between them—the moisture in this case being extracted by pressure as in the common process of 'wringing.' In the various branches of textile and paper manufacture, drying apparatus adapted to the particular industry is used, and is described in the separate articles on these subjects.

DRYING OILS. See Oils.

DRY MURRAIN mŭr′rĕn. See Texas Fever.

DRYNESS. A technical term in painting, used to indicate a style in which the drawing is hard, angular, and formal, and the color deficient in harmony and mellowness. It is opposed to a free method of drawing, and to the unctuous manipulation of pigment. Dryness indicates a defect that seems as much the result of the personal temperament of the painter as of any misuse of the materials which are the resources of his art. The earlier works of the Italian and of the Flemish schools, and their imitators, the pre-Raphaelites, have been criticised for this defect, but the fault is by no means confined to the old masters.

DRYOPE, drī′ō-pē (Lat., from Gk. Δρυόπη). The daughter of Dryops, a King of Thessaly, who was the reputed ancestor of a people called Dryopes. She was the mother of a son by Apollo, who visited her in the form of a tortoise. She was finally carried off by the wood-nymphs and changed into a poplar.

DRY'OPHIS. See Langaha and Whip-Snake.

DRY PILE. A voltaic pile or battery consisting of a number of disks of paper covered with zinc foil on one side and gilt or black oxide of manganese on the other. Various modifications of the above form are also known by the same name. Following the invention of Volta (see Voltaic Cell or Battery), Behrens, in 1805, constructed a pile in which paper was used instead of moistened cloth, in consequence of which it was called a dry pile. The term dry pile is really a misnomer, as the pile is inactive unless the paper contains a certain amount of moisture. Behrens's construction was modified and improved by Zamboni, by whose name the dry pile is often known. In this apparatus the pile was made of so-called silver paper and paper which had been rubbed with manganese peroxide. The couples were made of small disks of the paper so treated, placed together with their coated sides outward, and these were piled up to the number of a thousand or more, each couple or pair facing in the same direction. The entire pile was then firmly pressed into a glass tube varnished with shellac, and finally covered on the ends with brass caps. These have been made with as many as 20,000 pairs of disks and capable of charging a thin Leyden jar of 350 square centimeters surface in ten minutes to such an extent that its discharge melted 2.5 centimeters of platinum wire of .05 millimeters diameter.

The dry pile was employed by Behrens and Bohnenberger in the construction of a very delicate gold-leaf electroscope, commonly known by the latter's name. For this purpose the dry pile was constructed in two columns connected together below, so that the poles were at the upper ends. Between these poles a single gold leaf was suspended. As one pole is positive and the other negative, a very slight charge given to the gold leaf is sufficient to make it move toward one of the poles of the dry pile. The dry pile has also been applied to the construction of a 'perpetual motion' electric pendulum, in which case it is divided into two columns, in the same way as in the electroscope just described, and between them a very light pendulum rod is balanced on knife-edges. On the upper end of the rod is a light metal ring which oscillates between the two poles. The pendulum inclines first to one side and the ring touches one pole, at which it is charged. The pendulum is then repelled and carries it to the opposite pole, where the charge is neutralized, and it receives a charge of the opposite polarity, which reverses its motion. This action is repeated indefinitely. Such a pendulum has been in continuous motion in the University of Innsbruck since 1823. The period of its oscillation varies slightly with the humidity of the atmosphere. The energy expended is exceedingly minute, as no pile can generate a sensible current except by a corresponding consumption of its materials in the shape of chemical action. See Voltaic Cell or Battery.

DRY POINT, or **DRY-POINT WORK.** The art and process of engraving on metal with a needle or other sharp point which scratches the surface. It differs essentially from line-engraving in that none of the metal is cut away; and from etching in the absence of acid which corrodes the metal. The scratches of the point cause a certain turning up or accumulation of the metal, in rough projection, beside the scratch or cut; this roughness is called the bur, or burr, and has much to do with the peculiar effect of the prints on paper. Dry-point work is often used upon a plate which has been previously etched, because it can be applied without recoating the plate with the varnish and then using the mordant. (See Line-Engraving.) The term dry point is also applied to the sharp instrument with which the plate is scratched. See Burin.

DRY ROT. A popular name for the decay of timber after it has been seasoned. Dry rot is usually slow in its action, though under some circumstances it may be rapid and destructive, ruining edifices and causing serious accidents. Dry rot is caused by the fungus Merulius lachrymans. Somewhat similar effects are due to certain species of Polyporus. The disease is quite common in timber that is exposed to moisture, as the ends of joists set in damp walls, wainscoting about sinks, etc. The timber is ultimately reduced to powder within a thin surface shell of sound wood. Although called dry rot, moisture is essential for the development of the fungus that causes it. The spores germinate and send their mycelium through the wood in all directions, attacking and destroying the wood fibres. At first the fungus appears as a thin white film which gradually thickens at the centre and changes to a rusty brown color. A kind of timber known as red striped shows the beginning of dry rot. Perfectly sound timber may become infested by spores gaining entrance through cracks in the ends of logs, which, when wet, swell up. If the moisture be constant, the dry rot continues to grow, weakening the timber. The timber may dry out without destroying the fungus, which recommences developing when moisture is again present. The use of some kinds of sound-deadening material, such as wet cement, coal-ashes, etc., is very favorable to the development of dry rot. Only dry gravel or coarse sand should be used. Coal-cinders, etc., are alkaline, and the spores of Merulius lachrymans can be germinated only in the presence of alkalies. Timber that is well seasoned and protected by paint will not be attacked by dry rot.

A number of fungi attack the wood of trees, causing what is often called dry rot. Most of these fungi belong to the class of toadstools and shelf fungi, and sometimes are seriously destructive. This form of rot is caused on apple-trees by Polyporus hispidus; on oak, alder, poplar, locust, and larch by Polyporus sulphureus; on larch, Scotch and white pine, by Polyporus Schweinitzii; on conifers by Fomes pinicola, etc. Dædalea quercina is a common saprophyte upon oak-stumps and oak-trees. The mycelium of this species forms leathery mats and is believed to be parasitic. The decomposing oak wood assumes a grayish brown color.

DRY STOVE. See GREENHOUSE.

DRY TORTU'GAS. A group of ten islets belonging to Monroe County, Florida, and situated at the extreme west end of the Florida Keys in latitude 24° 37′ N. (Map: Florida, B 5). They are of coral formation, low, and are partially covered with mangrove bushes. Fort Jefferson, on one of them, was a penal station during the Civil War.

DUAL (Lat. *dualis*). A technical term of grammar, used to denote that form of the noun, pronoun, adjective, or verb which refers exclusively to two persons or things. The dual number differs, therefore, from the singular number, which relates to one alone, and from the plural number, which relates indefinitely to many. The dual is regularly found in Sanskrit and in ancient Greek; and in Latin it appears in the pronoun *ambo* (both), and in the numerals *duo* (two), *octo* (eight, i.e. two sets of four), and probably in *viginti* (twenty, i.e. two sets of ten). It is not generally found in the Teutonic languages; yet the Gothic has it in the verb, and the Anglo-Saxon shows traces of it in two pronominal forms. It occurs in the Semitic languages, e.g. the Arabic and the Hebrew, though in the latter only in the nouns.

DUAL CONTROL. See EGYPT.

DU'ALINE (from *dual*, Lat. *dualis*, relating to two). A variety of dynamite invented by Dittmar. The absorbent, viz. cellulose derived from wood fibre, is nitrated and saturated with nitroglycerin. The composition of dualine is said to be, nitro-glycerin, 50 parts; fine sawdust, 30 parts; and potassium nitrate, 20 parts.

DUALISM (Lat. *dualis*, relating to two). In philosophy, the theory that the universe is explicable only as a whole with two fundamentally different kinds of constituent elements. The ancient dualism of matter and form has in modern times been replaced by a dualism of mind and matter. Among modern philosophers Descartes was the first to emphasize the radical difference between thinking substance (mind) and extended substance (matter). The difficulty suggested by this view was to explain how mind and matter interact as they apparently do in experience. This perplexity caused some of his followers to deny interaction and assert concomitance of variation (see OCCASIONALISM); it caused others to deny the truth of dualism altogether (see MONISM; SPINOZA; LEIBNITZ). Since Descartes's day the question has been in constant debate, and even to-day there is no unanimity among philosophers as to the relative truth of dualism and its rivals. Within recent years the interest awakened by scientific psychology has brought the problem more to the fore, but even in psychology there is no consensus on the subject. (See PARALLELISM.) Only a brief constructive criticism can be undertaken here. The sole source from which a satisfactory solution can be obtained is experience. Does experience present us with one or two or even more absolutely different and fundamentally unrelated elements? In the first place, the contents of experience, the various sensations, centrally and peripherally aroused, the affections and volitions, are, without question, qualitatively different. These differences may shade into each other (see CONTINUITY, LAW OF), but no recognition of this fact can negative the fact of difference. If monism (q.v.) denies the qualitative difference, it is of course false. Some monism does this. But other forms of monism are more subtle. While admitting the existence of various differences, they assert that these differences are various manifestations of a simple substance. Their views stand or fall with the conception of substance (q.v.). But as the only tenable conception of substance seems to be that it is a synthetic unity of various quantities, it would seem that while it is possible, and no doubt correct, to think of the universe as one connected system, or, in other words, a synthetic unit, it is just as necessary to think of the differences within the unity. If monism be defined as the doctrine of the fundamental oneness of things, it is compatible with pluralism if that is defined as the doctrine of the fundamental plurality of things; since in a synthetic unity neither the unity is more fundamental than the differences, nor the differences than the unity. But is dualism compatible with monism and pluralism thus harmonized? Evidently it is, if pluralism means that all the differences in the universe can be reduced to two classes, the psychical and the physical, however these may be differentiated from each other, and if it asserts that the differences between these classes cannot be obliterated; for, as we see, tenable monism does not deny differences, but asserts unity. Dualism is inconsistent with pluralism only if dualism denies the existence of more specific distinctions than those of psychical and physical. This dualism never does. Dualism is inconsistent with monism only if it denies the possibility of recognizing the psychical and the physical as two aspects of one and the same experience. Dualism sometimes does this, and when it does it is false, for it overlooks the fact that the psychical and the physical are distinctions found correlated within the unity of experience. But dualism need not deny the correlation of physical and psychical within a synthetic unity, while yet insisting upon their irreducible differences. Thus we find that monism, dualism, and pluralism are mutually compatible, if the fact is regarded that the maintenance of fundamental unity is compatible with that of fundamental duality of distinctions within that unity, and that fundamental duality of distinctions is compatible with fundamental multiplicity of more specific distinctions. The question as to the form in which the fundamental unity of the universe must be conceived is treated elsewhere. See Monism.

But one further question remains to be discussed here. In what way must the correlation of the physical and the psychical be conceived? Are they merely parallel distinctions within experience, or do they interact? This again depends upon the meaning of terms. If by interaction is meant mechanical interaction or the transfer of energy in accordance with the law of the transformation of energy (see Energetics), then interaction is impossible unless it can be made out that psychical activity is a mode of special motion (materialism). This cannot be done. All that can be made out empirically is that certain changes in the psychical are accompanied and followed by certain changes in a certain portion of the physical phenomena, viz. the body, and vice versa. This may be expressed by saying that there is merely a parallelism. But if by interaction is meant that there is causal connection in the sense in which causality (q.v.) is now used by the best modern logicians, there is interaction. That is, certain psychic events are invariably sequent upon certain physical events, and vice versa. See Knowledge, Theory of.

DUALITY (Lat. *dualitas*, state of being twofold, from *dualis*, relating to two). A principle of geometry by which one proposition is transformed into another through the interchange of a pair of elements; e.g. the proposition, If two triangles have two *sides* and the included *angle* of the one respectively equal to two *sides* and the included *angle* of the other, the triangles are congruent, may be transformed by the interchange of the words *sides* and *angles* into another familiar proposition: If two triangles have two *angles* and the included *side* of the one respectively equal to two *angles* and the included *side* of the other, the triangles are congruent. This principle is often called the principle of reciprocity, and is extensively used in geometry. Although the reciprocal of a valid proposition is not of itself necessarily valid, it often suggests new possible theorems for investigation. In plane geometry the dual elements most commonly interchanged are:

point—line;
line—point;
angles of a triangle—
(opposite) sides of the triangle;
sides of a triangle—
(opposite) sides of the triangle;
pencil of lines—range of points;
range of points—pencil of lines.

Similarly there are dual propositions of solid geometry, as those formed by interchanging the words *straight line* and *plane;* e.g. two intersecting *straight lines* determine a *plane;* two intersecting *planes* determine a *straight line.* Such propositions also exist, one in plane geometry and the other in solid geometry, as when the terms *triangle* and *trihedral angle* are interchanged; e.g. one *side* of a *triangle* is less than the sum of the other two; one *face angle* of a *trihedral angle* is less than the sum of the other two. The term duality appears in the projective geometry of Gergonne (1813), and the development of the 'principle of duality' in another work by the same author (1826). This principle is a powerful agent of modern geometry, and it has been applied to various properties of curves.

DUANE, dû-ăn′, James (1733-97). An American lawyer and jurist. He married into the Livingston family, studied law, and attained great prominence in his profession, before the Revolution. In the heated political discussions preceding the war, he opposed all radical measures, being ready to sacrifice much for the sake of peace. He was chosen a delegate to the first Continental Congress in 1774, and aroused violent opposition by his proposal for a recognition of the validity of the British Navigation Acts and his advocacy of Galloway's scheme for a union of all the colonies under a chief magistrate appointed by the King. His distrust of a republican form of government led him vigorously to oppose the adoption of the Declaration of Independence. He continued to hope for pacification until the last, but when the break came he threw in his lot with the Patriot party. He continued a member of the Continental Congress throughout the entire Revolutionary period, taking an active part in the debates. He was one of the authors of the first New York State Constitution, was a member of the Committee of Safety in New York City in 1776-77, and after the evacuation of the city by the British in 1783 he was chosen the first Mayor under the new charter, serving until 1789. In that year he was appointed by Washington to the office of United States District Judge for New York, which he held until 1794, rendering many decisions which were of considerable importance in the formative period of the country's existence.

DUANE, James Chatham (1824-97). An American military engineer, born in Schenectady, N. Y. He graduated at Union College in 1844 and at West Point in 1848; commanded the engineer company in the Utah expedition of 1858, and was instructor at West Point from that year until 1861. In the Civil War he served with distinction as captain of engineers in the Peninsular Campaign of 1862; was chief engineer of the Army of the Potomac in the battles of South Mountain and Antietam; was chief engineer of the Department of the South for a time in 1863; and from July, 1863, until the close of the war again served in the Army of the Potomac. He was brevetted brigadier-general in 1865; had charge of the construction of the fort at Willets Point, N. Y., from 1865 to 1868; served as superintendent of fortifications on the Maine and New Hampshire coasts, and in 1886 became chief of engineers with the regular rank of brigadier-general. He published a *Manual for Engineer Troops* (1862).

DUANE, William (1760-1835). An American politician and journalist, born in northern New York near the banks of Lake Champlain. He was sent to Ireland in 1771 to be educated, learned the printer's trade, and in 1784 went to British India, where he made a fortune, and established a newspaper called *The World* at

Calcutta. In consequence of too free criticism of the Government authorities there, Duane was kidnapped at the command of Sir John Shore, the Governor, and deported to England, while his property in India was confiscated. Duane's efforts to secure relief, either from the East India Company or the British Government, were unavailing, and he again entered the field of journalism, becoming editor of the *General Advertiser,* in London, a paper which later became the *London Times.* In 1795 he returned to America, where he became associated with Benjamin Franklin Bache in Philadelphia, in editing the *Aurora,* one of the strongest Republican organs in the country. Forming an alliance with Michael Leib and other radical Republicans, he dominated the party in Pennsylvania for several years. In the *Aurora,* following the journalistic methods introduced in America by Cobbett, he attacked his political and personal enemies bitterly and unsparingly, filling his columns with fierce invective, insinuations, and scandal of every sort. Not only were the Federalists the objects of his attacks, but, disappointed in not receiving from Jefferson rewards commensurate with what he conceived to be the value of his services to him, he set out to hamper the Administration, and to sow discord among its members. He attacked Gallatin constantly, attempting to arouse Jefferson's jealousy by declaring that he was seeking to become his successor in the Presidency. In 1800 charges made by him in connection with the Ross Electoral Count Bill led to his being summoned before the bar of the United States Senate on a charge of libel. He was arraigned, but refused to appear for trial or put in a defense, denying the Senate's jurisdiction. He was adjudged guilty of contempt, and his arrest ordered, but he was never arrested. In Pennsylvania politics he exerted great influence, and originated the organization known as the 'Friends of the People' in opposition to that wing of the party represented by Gallatin, Dallas, and McKean. In 1804 he pressed the wholesale impeachment of the State Supreme Court judges. The transfer of the seat of government to Washington decreased the importance of the *Aurora,* which grew more abusive as its influence grew less. In 1808, just before retiring, Jefferson appointed Duane a lieutenant-colonel in the army. He continued to edit the *Aurora,* and attacked Madison in particular, who quieted him in 1813 by an appointment as adjutant-general. He sold the *Aurora* in 1822, and after traveling in South America, wrote an account of it entitled *A Visit to Columbia in 1822-23* (1824). He also published *The Mississippi Question* (1803); *Military Dictionary* (1810); *An Epitome of the Arts and Sciences* (1811); *Handbook for Riflemen* (1813); *Handbook for Infantry* (1813); and *American Military Library* (1819).

DUANE, William John (1780-1865). An American lawyer and financier. He was born in Clonmel, Ireland; studied law; was admitted to the bar in 1815, and practiced his profession in Philadelphia. He obtained distinction as a lawyer, and, becoming interested in education, served as a trustee and subsequently as a director of Girard College. In 1833 he was appointed Secretary of the Treasury by President Jackson, but was removed later in the year for refusing to withdraw the Government deposits from the United States Bank without authority from Congress. He was the author of *The Law of Nations Investigated* (1809); *Letters on Internal Improvements* (1811); and *Narrative and Correspondence Concerning the Removal of the Deposits* (1838).

DUBAN, dụ'bäɴ', Jacques Félix (1797-1870). A French architect. He was born in Paris, and was educated by Debret at the Ecole des Beaux-Arts, and in Italy, where he remained for several years. Returning to Paris in 1828, he was appointed architect for the Ecole des Beaux-Arts in 1832, and intrusted with the extension of that building. About 1845 he undertook the restoration of the palaces of Blois, Dampierre, and Chantilly. As architect of the Louvre he displayed admirable taste in restoring the façade of the old wing of the building and in making various other noteworthy improvements. Many of his architectural designs, such as the "Essai de restauration d'une maison antique à Pompéi," and the "Etudes faites en Italie," were exhibited in the Salon.

DU BARRY, dụ bȧ'rĕ', Marie Jeanne Bécu, Countess (1743-93). The celebrated mistress of Louis XV. She was born August 19, 1743, at Vaucouleurs, and was the natural daughter of a woman named Anne Bécu, who, about the year 1749, returned to Paris with her two children, Jeanne and Claude, and married a domestic named Rançon. The beauty of little Jeanne won her many friends, chief of whom was the rich financier and philanthropist, M. Billaud-Dumonceaux. Through him and the Abbé Arnaud she was admitted to the convent school of Sainte Aurore. There she remained for some seven or eight years, acquiring but little knowledge and enduring a great deal of irksome discipline. Emerging from the convent at the age of fifteen, Jeanne Bécu, or Jeanne Rançon, as she appears then to have been called, dwelt with her mother for a time and then became a lady's maid to Mme. de la Garde and later a milliner in the house of a certain Sieur Labille, where she doubtless had many love affairs. She was at this time known as Mlle. Lange, but soon assumed the more aristocratic cognomen of Beauvarnier. In the midst of her gallantries, Jeanne Bécu met the dissolute Comte Jean du Barry, known specifically as 'the Roué,' who made her his mistress and induced her to change her name to Vaubarnier or Vaubernier, by which she is generally known with the subsequently added prefix Gomard. For four years she presided over the gaming rooms of her lover, until, in the spring of 1768, she came in the path of Louis XV., who was immediately captivated by her charms, and made her his mistress. To add a show of decency to the matter, a husband was found for her in the person of Comte Guillaume du Barry, the brother of Comte Jean. For five years the du Barry ruled King and Court. The Duc d'Aiguillon was her confidant and adviser, the Chancellor Maupeou used her influence to dismiss and exile the Parlement in 1771, while the Abbé Ternay was suave and polite to her at all times. She was the patron of artists and men of letters, and during her reign she is estimated to have cost France 35,000,000 livres. She had numerous enemies, however, chief of whom was the Duc de Choiseul, Minister of Foreign Affairs, whose dismissal she brought about in 1770. The death of Louis XV. caused her retirement from the Court. Some time after the outbreak of the Revolution she went to London to see about the recovery of her jewels, which had been stolen. On her return, Robespierre caused her to be arrested, July, 1793. In November she was tried before the Revolutionary Tribunal, and accused of "having wasted the treasures of the State, of conspiracy against the Republic, and with having, in London, worn mourning for the late King." She was condemned to death and was sent to the guillotine, December 7, 1793. Most of the accounts given of Madame du Barry are unreliable. She was the victim of much slander, and stories concerning her amours are rarely trustworthy. The *Mémoires* (6 vols., Paris, 1829-30; Engl. trans., 1830, 1896), published under her name, have no real value. Consult: Douglas, *Life and Times of Madame du Barry* (London, 1896); Lacretelle, *Histoire de France pendant le dix-huitieme siècle* (Paris, 1830); Vatel, *Histoire de Madame du Barry, etc.* (Versailles, 1880); Goncourt, *La Du Barry* (Paris, 1880).

DUBBS, JOSEPH HENRY (1838—). An American Reformed clergyman, born at North Whitehall, Pa., and educated at Franklin and Marshall College, Lancaster, Pa., and at Mercersburg Theological Seminary. He is professor of history and archæology in Franklin and Marshall College, to which position he was appointed in 1875. He engaged in interesting researches bearing on the early history of the German churches in Pennsylvania. His principal publications include a *Historic Manual of the Reformed Church* (1885); *Home Ballads and Metrical Versions* (1888); *History of the Reformed Church* (1895); *Leaders of the Reformation* (1900); and contributions to the *Encyclopædia Britannica*, the *Schaff-Herzog Encyclopædia*, and similar works.

DUB'LIN (Ir. *Dubh-linn*, Black Pool). A maritime county in the east of Leinster Province, Ireland, bounded on the north by Meath, on the east by the Irish Sea, on the south by Wicklow, and on the west by Kildare and Meath (Map: Ireland, E 3). Area, 342 square miles. The coast, indented by creeks and bays, is 70 miles long. Dublin is the best-cultivated county in Ireland. The chief crops are oats, wheat, potatoes. There are important fisheries of turbot, brill, sole, plaice, cod, haddock, and oysters. The manufactures (chiefly of cottons, stockings, and embroidered muslins) are mostly confined to Dublin and the vicinity of the metropolis, and are of more value than in any other Irish county. The chief towns are Dublin, the capital of Ireland, and Kingstown. Unlike other Irish counties, Dublin County shows an increase of population from 148,210 in 1891 to 157,568 in 1901 (exclusive of Dublin City).

DUBLIN. The capital of Ireland, in Dublin County and the Province of Leinster, at the mouth of the river Liffey, in Dublin Bay on the east coast of Ireland (Map: Ireland, E 3). It is situated in latitude 53° 23′ N. and longitude 6° 20′ W. (observatory). It is built on land reclaimed from the sea, and is generally flat. The river, running from west to east between granite walls and parapets, divides the city into two almost equal portions joined by several bridges. On each side there is a spacious roadway, with tall houses and excellent shops. Near the custom house there are several large docks in communication with the Royal and Grand canals; the former connecting Dublin with the North Shannon and the west of Ireland, the latter with the southern portion of the same river and the south. The harbor and docks are protected by two large breakwaters. In the newer parts of Dublin the streets run at right angles and are remarkable for their breadth. The most imposing is Sackville Street, which is 120 feet broad. At its north end is the Rotunda, with Rutland Square—in its centre are the beautiful Ionic portico of the general post-office and Nelson's monument (upward of 130 feet high). A feature of Dublin is its squares, which are numerous, spacious, and sometimes well-kept. The southeast and northeast quarters contain many beautiful squares, with splendid streets and terraces. The centre, and the northwest quarter are the great emporiums of trade, and the residence of the middle classes, many of whom have private houses in the suburbs. The southwest division, part of which is called the 'Liberties,' once the seat of the silk trade, is the slum district. The streets in this quarter are narrow, crooked, and irregular. The city is surrounded by a 'circular road' nearly nine miles in length, forming a favorite drive and promenade.

There are numerous places of worship, Catholic and Protestant, monasteries, convents, priories, and a Jewish synagogue. The most remarkable among the Protestant churches are Saint Patrick's Cathedral, founded in 1190, and restored by the munificence of a single individual, and Christ Church, which has also undergone restoration; and among the Catholic, Saint Mary's, Saint Saviour's, Saint Augustine's, Saint Kilvin's. The public buildings include the Bank of Ireland, formerly the House of Parliament, Trinity College, the custom house, and the Four Courts. Dublin Castle has no pretensions to architectural beauty. There are monuments of William III. in College Green, now a paved street; of Nelson, the Duke of Wellington, Goldsmith, Burke, Grattan, and many others on various public sites. The environs of Dublin are especially beautiful. Rathmines, a southern suburb, has become a large township, and is the favorite residence of the wealthier part of the mercantile community. Glasnevin, on the north, deserves special notice as the favorite residence of the poet Tickell, of Addison, Steele, Parnell, Swift, Sheridan, and many other celebrities. In the cemetery at Glasnevin lie the remains of Curran, O'Connell, and Tom Steele. Phœnix Park is a magnificent area of over 1750 acres, in some parts level, in others with broken ground, having a large amount of timber and brushwood, which shelter herds of deer. It affords ample scope for military reviews, and is extensively used by the inhabitants of Dublin for recreation. The Lord Lieutenant or Viceroy of Ireland holds his court in Dublin Castle during the winter months, and in the summer season removes to the Lodge, situated beyond Phœnix Park.

The chief educational institution of Dublin is Trinity College and University. (See DUBLIN, UNIVERSITY OF.) There are also a Catholic university, which has a very successful medical school, and many literary and scientific societies. There are two botanic gardens. The hospitals, asylums, orphanages, and other charitable institutions are numerous, and liberally maintained. The municipal affairs are under the control of a town council of sixty members, comprising the Lord Mayor, aldermen, and councilors. The city owns docks and wharves, water-supply, markets, municipal tenements, electric lighting plant, maintains parks, zoölogical gardens, museum and library, art gallery, and model school. The city sends four members to Parliament. The chief manufactures are porter, whisky, and poplin, and there are glass-works, cotton and linen factories, and foundries. Dublin has a large import, but a decreasing export trade. Its chief imports are grain, raw cotton, metal ores, timber,. petroleum, sugar, cork, and butter; exports wool, manure, iron and steel manufactures, whisky. Over 8000 vessels enter and clear a gross tonnage of 4,850,000 annually. The total value of imports and exports averages $12,500,000. Dublin's shipping comprises 214 sailing and 103 steam vessels of 61,667 tons. Much of the inland traffic is carried on by the canals above mentioned and by the railways extending to all parts of Ireland. Population of county borough, in 1891, 268,587; in 1901, 290,638; and of the metropolitan police district, in 1891, 345,959; in 1901, 373,179.

HISTORY. Frequently called *Bally Ahclee*—town of the hurdle ford—from the ford of hurdles that spanned the river in this vicinity, this name was probably antedated by the perpetuated *Dubh-linn*—the black pool—and the *Eblana* of Ptolemy. Christianity was introduced by Saint Patrick, who, in 448, baptized the King of Baile-atha-cliath. From the ninth century until 1170, with interruptions, Dublin was held by the Danes. The Anglo-Norman Conquest by Henry II. finally dispossessed them. James II. held a Parliament here in 1689 and founded a mint, and in Saint Patrick's Cathedral William III. returned thanks for the victory of the Boyne. Lord Fitzgerald (q.v.) planned to seize the city and castle during the rebellion of 1798, but was captured before the attempt was made, and Robert Emmet (q.v.) also made an unsuccessful attempt in 1803. On May 6, 1882, Lord Cavendish, the newly appointed Secretary for Ireland, and the Under-Secretary Burke was murdered in Phœnix Park. Consult: Gilbert, *History of Dublin* (3 vols., Dublin, 1854-59); "Greater Dublin," in *London Municipal Journal* (1889); Gerald, *Picturesque Dublin, Old and New* (London, 1897); Gross, "Dublin," in *Bibliography of British Municipal History* (New York, 1897).

DUBLIN. A city and county-seat of Laurens County, Ga., 52 miles south-southeast of Macon, on the Macon, Dublin, and Savannah, the Central of Georgia, and other railroads, and on the Oconee River (Map: Georgia, D 3). It has a Carnegie Library. Its chief industries include cotton and oil mills and stave factories. First settled in 1807 and incorporated about 1850, its government, under a charter of 1905, is vested in a mayor, chosen biennially, and a unicameral council. Population, 1900, 2987; 1906 (local est.), 5000.

DUBLIN, UNIVERSITY OF. The chief, and for many years the only institution for higher education in Ireland. The first University of Dublin was established in connection with Saint Patrick's Cathedral in 1320, but, lacking an endowment, was never successful, and perished, probably at the dissolution of the cathedral foundation by Henry VIII. The present foundation, better known as Trinity College, is unique in having the organization and functions of both a college and a university. In 1591 Queen Elizabeth issued a charter incorporating a college, as 'the mother of an university,' with the title of 'the College of the Holy and Undivided Trinity, near Dublin.' It was expected that other colleges would be formed about this nucleus, and that a university after the English model would gradually arise in the Irish capital. This expectation was, however, disappointed, and though the institution has flourished, it has not been in the way expected. The new foundation received little but its charter from the Queen; the corporation of Dublin gave to it the grounds and ruins of the suppressed monastery of All Hallows, and a building fund was raised by subscription among the Irish gentry. The first chancellor was William Cecil, Lord Burghley, Elizabeth's great minister, who was also chancellor of Cambridge. The first five provosts were Cambridge men, and by this connection the influence of the English university on the Irish foundation was very strong. The exclusive royal patronage and control by the English Crown promised much, but under Elizabeth the college was but poorly supported and led a precarious existence. James I. supplied an endowment of some £400 a year as a pension, together with certain estates in Ulster, which insured its future. In 1601 the English troops defeated the Spanish at Kinsale, and in commemoration of their victory subscribed £1800 from the arrears of their pay to establish a library for the college. The two trustees of this fund were Dr. Challoner and Mr., later Archbishop, Ussher. Subsequently the collection of Ussher was, with some difficulty, purchased by the officers and soldiers of the army of the Commonwealth of Ireland, and from these two unusual contributions the foundation of the present collection was laid. The original constitution of the university, meanwhile, having been found defective, new statutes were framed and issued under the direction of Archbishop Laud in 1637. A considerable part of these are still in force. Under the present system, the administration rests in the hands of a board consisting of the provost and senior fellows, in connection with the visitors, a council (since 1874), and the senate. The provost is appointed by the Crown and is the chief officer of the college. The board consists of the provost and senior fellows of the college, and carries on ordinary college business. The council consists of the provost, four members of the senate chosen by the senior fellows, four by the junior fellows, four by the professors not fellows, and four by the senate at large. The council cooperates with the board in regulating the studies and the appointment of professors. The senate consists of the chancellor, vice-chancellor, and all masters and doctors of the university whose names are on its books. The fellows are of two grades, senior and junior. The senior fellows comprise the chief officers of the college; the junior fellows form the bulk of the tutorial force of the college. Fellows, chosen primarily by examination, are promoted by seniority. There is a considerable body of professors, some forty in all, besides lecturers, and some special instructors. There are seventy scholarships, besides many prizes. As at Cambridge, the old distinctions among undergraduates still exist. There are five classes of students; noblemen, sons of noblemen, and baronets; fellow-commoners; scholars; pensioners, or ordinary students in art; and sizars, or poor students, assisted by the college. Of the last there are some thirty, who obtain their positions by competitive examination.

Entrance to the college is by examination, and there is an additional examination for high places at entrance. The majority of men enter the arts course, but there are courses leading to degrees in music and in engineering, distinct from that in arts. The course of study usually extends over four years, and may be an ordinary or an honor course. In the latter, higher requirements are demanded. In each year one term of the three must be 'kept' by examination, the others by attendance on lectures or by examination. The required course for 1900-01 gives the best idea of the arrangements of studies. First year ('junior freshman'), mathematics, Greek, Latin, Latin composition, English composition; second year ('senior freshman'), the same, with the addition of logic and mathematical physics in the second and third terms. The final freshman examination covers all these. In the third year ('junior sophister') mathematical physics, logic, and English composition are required throughout the year, astronomy for one term, the rest of the work being optional. In the fourth year ('senior sophister') astronomy, ethics, and English composition are compulsory throughout the year, logic for two terms. The degree examinations cover these as well as the optional work. Men going into the profession of law, medicine, and divinity are allowed to anticipate their professional courses in these last two years. These courses lead to the degree of B.A. The degree of M.A. must be a B.A. of at least three years' standing. A Doctor of Science must be a B.A. of three years' standing, present a thesis, and, if required, pass an examination. The same requirements, in some form or other, apply to all other advanced degrees, in literature, divinity, medicine and surgery, engineering, and music.

The university is possessed of a number of valuable collections. The library contains over 285,000 volumes. The astronomical observatory of Trinity College is situated at Dunsink, five miles from the college. There are, pertaining to the college, museums of natural philosophy, astronomy and zoölogy, geology and mineralogy, engineering, pathology, materia medica, and an herbarium, botanical laboratory, and gardens. The grounds of the college in the centre of the city are extensive, the buildings large and handsome. Among the more famous names connected with the institution may be mentioned Archbishop Ussher, Burke, Sheridan, Swift, Goldsmith, Berkeley, and Sir W. Hamilton. Consult: *The Book of Trinity College* (Dublin, 1591-1891); Mahaffy, *An Epoch in Irish History: Trinity College, Its Foundation and Early Fortunes* (London, 1903); *The Irish University Question* by "Catholicus" (London, 1905); *Dublin University Calendar.*

DÜBNER, dụb′nẽr, FRIEDRICH (1802-67). A German classical philologist. He was born at Hörselgau, near Gotha, and after devoting six years to philological studies at the University of Göttingen, was professor at the Gymnasium at Gotha, from 1826 to 1831. During that period he attracted attention by his admirable critical edition of Justin (1831), and in 1832 he was called to Paris to superintend Didot's new edition of Stephanus's *Thesaurus Linguæ Græcæ.* Afterwards he was employed on Didot's *Bibliotheca Græca*, to which he contributed the critical editions of Plutarch's *Moralia* (1841); of Maximus Tyrius (1841); of Arrian (1846); and of Himerius (1849); the scholia to Aristophanes (1843) and Theocritus (1849); the *Fragmenta et Spuria* (1855); and the *Anthologia Palatina* (1864). He wrote the commentaries on Horace and Vergil for Didot's *Collection Elzévirienne;* at the request of Napoleon III., prepared a critical edition of Cæsar (1867); and published a number of school editions of the classics. Consult Godefroy, *Notice sur Friedrich Dübner* (Paris, 1867).

DUBNO, dōōb′nô. A town in the Russian Government of Volhynia, situated in a marshy region on the Ikva, a little over 30 miles from the Austrian frontier. Population, in 1897, 13,800, mostly Jews.

DUBOC, dụ′bôk′, EDUARD (1822—). A German author of French extraction who wrote under the pseudonym 'Robert Waldmüller.' He was born in Hamburg, the son of Edouard Duboc, author of *Dignité de l'homme.* In addition to the tragedy *Brunhild* (1873), the drama *Die Tochter des Präsidenten* (1880), and translations of the poems of François Coppée, and of Alfred Tennyson's *Enoch Arden* (1867; 35th ed. 1893) and *In Memoriam* (under the title *Freundesklage*, 4th ed. 1876), he wrote a great number of poems, novels, and romances, some of the more popular of which are: *Unterm Schindeldach*, idyls (1851); *Das Vermächtnis der Millionärin*, a novel (1870); *Walpra*, an elegy (1873); *Leid und Lust*, a novel (1874); *Die Somosierra* (1881); *Darja* (1884); *Felicitas* (1893); and *Liebesstürme* (1897).

DUBOC, JULIUS (1829-1903). A German author, brother of Eduard Duboc. He was born in Hamburg, and studied philosophy and history in Giessen, Leipzig, and Berlin. His publications include: *Geschichte der englischen Presse* (after Grant, 1873); *Die Psychologie der Liebe* (1874; 2d ed. 1883); *Hundert Jahre Zeitgeist in Deutschland* (1889; part ii., 1893); *Fünfzig Jahre Frauenfrage in Deutschland* (1896). In addition to these, he published a great number of essays, a collection of novelettes, *Herzensgeschichten. Ein Novellenstrauss* (1888), and the one-act drama entitled *'s Herzblattl* (published under the pseudonym of 'Julius Lanz.'

DUBOIS, dụ-bois′. A borough in Clearfield County, Pa., 27 miles northwest of Clearfield, the county-seat; on the Buffalo, Rochester and Pittsburg, the Buffalo and Susquehanna, and the Pennsylvania railroads (Map: Pennsylvania, C 2). It is principally engaged in coal-mining and lumbering; but there are also iron-works, foundry and machine shops, flour and lumber mills, tannery, etc. Dubois was settled in 1873, and was incorporated as a borough in 1881. Population, in 1890, 6149; in 1900, 9375.

DU BOIS, AUGUSTUS JAY (1849—). An American mechanical and civil engineer, born at Newton Falls, Ohio. He graduated in 1869 at the Sheffield Scientific School of Yale, studied for two years (1872-74) at the Mining School of Freiburg (Saxony), and from 1874 to 1876 was professor of civil and mechanical engineering in Lehigh University. In 1876-84 he was professor of mechanical engineering at the Sheffield Scientific School, and in 1884 was appointed to the chair of civil engineering in the same institution. His publications include a translation and edition of two volumes of Weisbach's *Ingenieur und Maschinen-Mechanik* (*The Theory of the Steam Engine*, 1878), a translation of Professor Röntgen's *Wärmetheorie* (*The Principles of Thermodynamics*, 1880); *The Strains in Framed Structures* (1883; 11th ed. 1900); *The Elements of Mechanics* (3 vols., 1893-95); *Mechanics of Engineering* (1902).

DUBOIS, dụ'bwä' (Clément-François) Théodore (1837—). A French organist and composer. He was born at Rosnay, Marne, and, after instruction under local teachers, entered the Paris Conservatory in 1853. His teachers were Marmontel (pianoforte), Benoist (organ), Bazin (harmony), and Ambroise Thomas (fugue and composition). He graduated in 1861, winning the Grand Prix de Rome with his popular cantata *Atala*. His most important appointments have been choirmaster of Sainte Clotilde; organist at the Church of the Madeleine; professor of harmony at the Conservatory (1871); professor of composition at the same institution (1891); and successor of Gounod as chairman of the Academy (1894), and of A. Thomas as director of the Conservatory (1896-1905). He was also elected an officer of the Legion of Honor, and made a member of many important foreign orders. He has been especially successful in organ composition, possibly because of his own brilliancy as an organist, although he has also won wide recognition for operatic and orchestral compositions. His more important works are *Aben Hamet*, a grand opera, produced in 1884; a three-act *Idylle dramatique* (1895); three oratorios: *Les sept paroles du Christ* (1867); *Le paradis perdu* (1878); and *Notre Dame de la Mer* (1897). Among his many other published works are cantatas; several masses; many orchestral works; arrangements for organ, harp, and other instruments; concertos for both organ and violin; and several impressive *a cappella* choruses.

DUBOIS, Edmond Paulin (1822-91). A French hydrographer and inventor of marine instruments, born in Brest. In 1851 he was appointed professor at the Ecole Navale in Brest. His most important inventions are a gyroscope and a compass equipped with a double needle to determine the deflection caused by the ironwork of a vessel. In addition to numerous contributions on astronomy and hydrography to scientific magazines, he published the following important works: *Cours d'astronomie* (3d ed. 1876); *Cours de navigation et d'hydrographie* (2d ed. 1869); *De la déviation des compas à bord des navires* (1867); *Cercle nautique* (1888).

DUBOIS, Guillaume (1656-1723). A cardinal and prime minister of France. He was born at Brives-la-Gaillarde, the son of a country doctor, and was educated at the Collège Saint Michel in Paris. Appointed tutor to the young Duc de Chartres (the future Duke of Orleans), he gained great influence over his pupil, whose constant companion he was in peace and in war, and whose marriage to Mademoiselle de Blois, a natural daughter of Louis XIV., Dubois brought about. His political career began in 1701, when he was made secretary to the French embassy at London. In 1715 he became private secretary to his pupil, now the Regent, and quickly made himself the virtual ruler of France. The key of his foreign policy was the bridling of Philip of Spain's ambition and the overthrow of Philip's minister, Alberoni. Dubois effected this by means of the famous union of England, France, and Holland in the Triple Alliance (1717), later changed to a Quadruple Alliance by the accession of Austria. This coalition worked a revolution in French policy, since by the new arrangement friendship was made with England, an ancient enemy, and enmity declared against an old ally, Spain. The last years of Dubois were filled with great labors and high honors. In rapid succession he became Archbishop of Cambrai (1720), Cardinal (1721), and Prime Minister (1722). He died August 10, 1723. Dubois has been portrayed by his enemy, Saint-Simon, as a deformed and debauched pander to the Regent. It is known now that malice has darkened the picture, though Dubois was by no means an exemplary citizen or statesman. The political genius of the man, however, can hardly be denied. Consult: Sévelinges, *Mémoires secrets et correspondance inédite du cardinal Dubois* (Paris, 1815); Capefigue, *Le cardinal Dubois* (Paris, 1861); and for a treatment of Dubois's foreign policy, Wiesmer, *Le régent, l'abbé Dubois et les Anglais* (Paris, 1891).

DUBOIS, Jean Antoine (1765-1848). A French missionary in the East Indies, born at Saint Ramèze, Ardèche. He wrote several books concerning India, the best known of which is the *Descriptions of the Character, Manners, and Customs of the People of India, and of their Institutions, Religious and Civil* (1816), a standard work which was brought out in a new edition in London in 1900.

DUBOIS, Louis (1830-80). A Belgian painter, born in Brussels. His paintings, which strongly suggest the influence of Courbet, are full of animation and a coloring which at times strikingly reminds one of the brilliancy of Jordaens. In the choice of subjects Dubois reveals versatility, while his treatment of them entitles him to be ranked among the most prominent representatives of the realistic school. His subjects include portraits, landscape, marines, genre pictures, and still life. His principal works include: "Priest Preparing for Mass" (1857); "Roulette" (1860); "Landscape with Dead Roes" (1863); "Rice Eater" (1872); "Billiard Player" (1878); "The Meuse Near Dordrecht."

DUBOIS, Paul (1829-1905). A French sculptor and painter, born at Nogent-sur-Seine (Aube). After studying law for several years he entered the studio of Toussaint (1856). In 1863 he exhibited "Saint John the Baptist" (Luxembourg). The most popular of his works, "The Florentine Minstrel" (also in the Luxembourg), won a medal of honor in 1865, and shows Dubois's study of Renaissance models. He was made conservator of the Luxembourg in 1873, and director of the National School of Fine Arts in 1878. His monument to General Lamoricière, in the cathedral at Nantes, received the medal of honor at the Exposition of 1878. It is designed in Renaissance style, and decorated with statues and bas-reliefs. Among the former are the figures of Charity, Faith, Military Courage, and Meditation. His other works in sculpture include a "Virgin and Child" (1867); "Birth of Eve" (1873); "Saint John the Baptist as a Child" (1860, Luxembourg); an equestrian statue of the Constable de Montmorency (1886); a statue of Jeanne d'Arc (1889) for the city of Rheims, which had the honor of a commemorative medal; "Alsace and Lorraine" (1900), a replica of which he had finished just before his death; and portrait busts of Pasteur, Baudry, Gounod, Henner, and others. His work as a painter is mostly in portraiture, and a notable example of it is "My Children" (1876), both in color and drawing an admirable work. He was made a member of the Legion of Honor in 1867, commander in 1886, and grand officer in 1889. Consult Brownell, *French Art* (New York, 1892).

DU BOIS, dụ-bois′, William Ewing (1810-81). An American numismatist, born at Doylestown, Pa. He was assistant assayer in the United States Mint in Philadelphia, Pa., from 1836, and chief assayer from 1872. In addition to accumulating the comprehensive and important coin-collection at the mint, he published a *Manual of Gold and Silver Coins of All Nations* (1842-51).

DU BOIS-REYMOND, dụ bwä′rā′mōN′, Emil Heinrich (1818-96). A German physiologist, born in Berlin. He was educated at the college of Neuchâtel, and became a theological student at the University of Berlin; but under the influence of Mitscherlich, soon abandoned theology to devote himself to chemistry, natural philosophy, mathematics, and geology. Dr. Edward Hallmann finally directed him toward medicine, and he became a pupil of Johannes Müller, the famous anatomist and physiologist. In 1841 young Du Bois-Reymond undertook to solve the problems of animal electricity proposed by Matteucci and Nobili, and entered upon the experimental work which he prosecuted for forty years. An extensive account of his first researches, with a description of the immense number of experiments made, largely by new methods and with apparatus of his own invention, appeared under the title *Untersuchungen über tierische Elektrizität* (2 vols., 1848-49). Previous attempts to observe electrical phenomena during the contraction of muscle had failed, and Du Bois-Reymond was the first to suggest tetanizing muscles in order to obtain an increased duration of contraction for observation. He discovered how to cause deflection of the magnetic needle by the voluntary contraction of living muscle; demonstrated electric phenomena in a tetanized nerve; caused a deflection of the needle of the galvanometer by molecular change, accompanying nerve currents; and showed that 'negative variation' is transmitted in a motor nerve from periphery to centre, and in a sensory nerve from centre to periphery. In 1848 Du Bois-Reymond was elected a member of the Royal Academy of Sciences of Berlin. In 1858, upon the death of Johannes Müller, he succeeded to the chair of physiology in the University of Berlin, and became director of the laboratory. In 1867 he became permanent secretary of the Academy of Sciences of Berlin, and later was made Imperial Privy Councilor. Several of his experimental and practical researches were in the domain of electricity, without reference to physiology. These include his important investigations of the aperiodic state of the magnetic needle, induced by high dampening powers. He invented the method of reading messages over the Atlantic cable by watching the beam of light reflected from a mirror attached to the needle of a galvanometer. He demonstrated, controverting Berzelius and Liebig, that the reaction of muscle substance at rest is neutral or slightly alkaline, and acid after death, while in the act of contraction acid is evolved. Du Bois-Reymond was a very successful teacher, and a popular lecturer in German, French, and English. He ranks, with Helmholtz and Virchow, as one of the greatest scientists Germany ever produced, his researches having laid the foundation of all our true knowledge in connection with animal electricity, and his observations forming permanent scientific material. Professor Burdon Sanderson remarked of him, "Du Bois-Reymond probably never made an incorrect observation or performed a faulty experiment." Besides the works mentioned he published *Ueber die Grenzen des Naturerkennens* (6th ed. 1884); *Gesammelte Abhandlungen zur allgemeinen Muskel- und Nervenphysik* (2 vols., 1875-77); and *Reden* (2 vols., (1886-87). His *Vorlesungen über die Physik des organischen Stoffwechsels* were published posthumously (1899). Consult Engelmann, *Gedächtnisrede auf Emil Du Bois-Reymond* (Berlin, 1898).

DU BOIS-REYMOND, Paul (1831-89). A German mathematician, brother of Emil Du Bois-Reymond. He was born in Berlin, studied medicine in Zurich, and afterwards went to Königsberg, where he devoted himself to physics and mathematics. In 1865 he became lecturer in mathematics at Heidelberg, and was appointed professor of mathematics at Freiburg (1870), Tübingen (1874), and in the Berlin Technological Institute (1884). His mathematical work was chiefly on differential equations, series, and the theory of functions.

DUBOSC, dụ′bŏsk′. The highwayman for whose crime Lesurques is arrested, in *The Lyons Mail.* Sir Henry Irving has assumed this double rôle with great success.

DUBOSSARY, dōō′bŏs-sä′rė, or Novie Dubossary. A town in the Russian Government of Kherson, situated on the Dniester, 85 miles northwest of Odessa (Map: Russia, D 5). It has some trade in tobacco, wine, grain, and other agricultural products of the surrounding district. The town was founded at the end of the eighteenth century. Population, in 1897, 13,200, consisting of Moldavians, Russians, and Jews.

DUBOVKA, dōō-bŏv′kȧ. A river port in the Russian Government of Saratov, situated on the right bank of the Volga, about 30 miles above Tzaritzin (Map: Russia, F 5). Formerly a place of considerable trade in agricultural products, Dubovka has lost its commercial importance since the completion of the railway line connecting Kalach on the Don and Tzaritzin on the Volga. Population, in 1897, 16,900.

DUBS, dōōps, Jakob (1822-79). A Swiss statesman. He studied law at Heidelberg, Bern, and Zurich; held several official positions in his native canton; was elected a member and in 1857 president of the Federal Court; and in 1864 and 1868 was elected president of the Confederation. In politics he was liberal and progressive. Among his publications are: *Die Schweizer Demokratie, in ihrer Fortentwickelung* (1866); and *Das öffentliche Recht der schweizerischen Eidgenossenschaft* (1877-78).

DUBUFE, dụ'bụf', Claude Marie (1790-1864). A French artist, born in Paris. He was a pupil of David, and began by painting mythological subjects. The best of this class is the "Apollon et Cyparisse" (in the Luxembourg). In 1827 he exhibited "Les Regrets" and "Les Souvenirs," which were very successful. He then gave himself up to the painting of genre pictures and portraits. Among these latter are Louis Philippe and his daughter the Queen of the Belgians.

DUBUFE, Edouard (1820-83). A French portrait and figure painter, born in Paris. He was a pupil of his father, Claude Marie Dubufe, and of Paul Delaroche, and his earlier works were mostly religious. His chief success, however, was in portrait painting, to which he afterwards confined himself. His works were well drawn, and their good finish, together with their smooth and elegant coloring, made them popular, especially among ladies of rank. Among his sitters were the Empress Eugénie (1853), Rosa Bonheur (1857), the Princess Mathilde (1861), and the Marquise de Gallifet. Among his portraits of men, which are better than those of women, were "Gounod" (1867), "Dumas fils" (1873), and "Emile Augier" (1876), in the Museum of the Luxembourg. Besides his portraits, the best-known of his paintings are "The Peace Congress of 1856 at Paris" (1857, in the Gallery of Versailles), and the "Prodigal Son" (1866), in the manner of Paul Veronese. He received the Cross of the Legion of Honor in 1837, and a first-class medal in the Salon of 1844. Consult Stranahan, *A History of French Painting* (New York, 1899).

DUBUFE, Edouard Marie Guillaume (1853 —). A French painter, born in Paris. He was the pupil of his father, Edouard Dubufe, and of Mazerolle. His works include figures and portraits, but he is especially known by his large allegorical paintings, executed with much freedom and skill in design. Notable among these are his "Sacred and Profane Music" and "The Trinity of Poets." He decorated with great elegance the ceiling of the foyer of the Comédie Française, portions of the Hôtel de Ville, of the Salle des fêtes de l'Elysée, and the new Sorbonne. He received a first-class medal in 1889, and was made a member of the Legion of Honor in the same year.

DUBUQUE, dōō-būk'. A city, port of entry, and county-seat of Dubuque County, Ia., 167 miles by rail west-by-north of Chicago, Ill., and 205 miles northeast of Des Moines; on the west bank of the Mississippi River, and on the Chicago Great Western; the Illinois Central; the Chicago, Burlington and Quincy; and the Chicago, Milwaukee and Saint Paul railroads (Map: Iowa, G 2). It has communication by boat with other points on the river, and is connected with the opposite shore by three bridges, one of which, 2000 feet long and 56 feet above high water, cost $135,000. Dubuque is built on and at the foot of picturesque bluffs. The business district occupies the lower level, and is regularly laid out with broad streets. The city has a public library; a fine United States Government building, including the post-office, custom house, Federal courts, etc.; seven asylums and hospitals; and many educational institutions, among which are several Roman Catholic colleges and academies, Wartburg Seminary (Lutheran), the German Presbyterian Theological School of the Northwest, and the Iowa Institute of Science and Arts. Dubuque is an important market for agricultural produce, and the centre of a large wholesale and jobbing trade, and of the lead and zinc mining industry of the Northwest. It has railway repair shops, enamel-works, flouring and lumber mills, pork-packing houses, iron and brass foundries, breweries, and manufactures of boots and shoes, carriages and wagons, agricultural implements, hardware, leather, furniture, toys, notions, bricks, oils, engines, boilers, steel ship-hulls, barrels, brooms, pearl buttons, sashes, doors, blinds, etc. Some war vessels for the Federal Government have been constructed at Dubuque. The annual income and expenditures of the city amount to about $660,000 and $560,000, respectively; the principal items of expense being $30,000 each for the fire and police departments, and $100,000 for schools. The oldest city in the State, Dubuque was named in honor of Julien Dubuque, a French Canadian who settled here in 1788. The first permanent settlement dates from 1833; four years later it was incorporated as a town, and in 1840 it was chartered as a city. Population, in 1890, 30,311; in 1900, 36,297; in 1905, 41,941.

DUC, dụk, Joseph Louis (1802-79). A French architect, born in Paris, and a pupil of Percier at the Ecole des Beaux-Arts. He won the Prix de Rome in 1825. While still a young man, he was chosen with Alavoine to design the monument in the Place de la Bastille (1840). In 1854 he and the architect Dommey began to enlarge and rebuild the Palais de Justice. Duc gave himself entirely to this task, which occupied him about twenty-five years. It is an imposing mass of buildings in the Neo-Classic style. Upon its completion Napoleon III. presented him with the exceptional prize of 100,000 francs, a portion of which the architect set aside to establish a biennial prize for high studies in architecture. He was made a member of the Institute in 1866, and inspector-general of all civil buildings in 1871. His other works include the monuments to Duban and Henri Cahieux.

DU CAMP, dụ kăɴ'. Maxime (1822-94). A French author, born in Paris. His more important books are: *Paris: ses organes, ses fonctions, sa vie* (6 vols., 1869-75), and a history of the Commune, *Les convulsions de Paris* (4 vols., 1878-79). His poems are gathered in *Les chants modernes* (1855), and *Les convictions* (1858). His best novel is *Mémoires d'un suicide* (1853). He wrote, also, *Egypte, Nubie, Palestine et Syrie* (1852); was one of the founders of the *Revue de Paris* (1851-58), and a frequent contributor to the *Revue des Deux Mondes*.

DU CANGE, dụ käɴzh, Charles du Fresne (1610-88). A French scholar, one of the greatest of the seventeenth century, born at Amiens. He became Government treasurer in his native town, but devoted his entire life to the study of the

Middle Ages. He is best known for his great *Glossarium ad Scriptores Mediæ et Infimæ Latinitatis*, published in three volumes in Paris in 1678, a veritable treasure of industry and erudition. It went through many editions, always with an increase of subject-matter, and was last published in ten volumes by Favre (Niort, 1884-87), and is the standard work on mediæval Latin. Du Cange planned a similar work for mediæval Greek, and published the *Glossarium Mediæ et Infimæ Græcitatis*, on a less extensive scale, in Lyons in 1688, the year of his death. He edited several Byzantine historians, with Latin translations, as *Paulus Silentiarius* (1670); *Zonaras* (1687); *Nicephorus Gregoras* (published posthumously in 1702); and the *Chronicon Paschale sive Alexandrinum* in 1688. Nor were his studies confined to the mediæval Greek and Latin writers. Among his many other works were: *Histoire de l'empire de Constantinople sous les empereurs français* (1657), and *Histoire de l'état de la ville d'Amiens, et de ses comtes*, found among his papers and published in 1841. Consult Fougère, *Essai sur la vie et les ouvrages de Du Cange* (Paris, 1852).

DUCAS, d͞oo'kȧs (Lat., from Gk. *Δοῦκας, Doukas*), MICHAEL. A Greek historian, who lived in the fifteenth century. He belonged to the imperial family of the same name at Constantinople. He wrote a trustworthy *History of the Fall of the Byzantine Empire* (edited by Bekker for the Bonn series of Byzantine historians, 1834), embracing the period from the death of John Palæologus I., 1355, to the capture of Lesbos in 1462.

DUCASSE, dụ'kȧs', JEAN BAPTISTE (1646-1715). A French naval officer, born at Saubusse. He entered the service of the Senegal Company, and afterwards that of the royal navy, in which he rose to be captain. In 1691 he was appointed Governor of Santo Domingo. He administered the affairs of the colony with great skill, and conducted a successful defense against an invasion by the English and Spanish during the War of the League of Augsburg. In 1697 he commanded the land forces in the capture of Cartagena, and in 1702, after a four days' fight, defeated a superior English fleet under Admiral Benbow. With rank of lieutenant-general of naval forces, he directed the blockade of Barcelona in 1714.

DUC'AT. A name formerly used throughout Europe for coins of different value, mostly of gold. Ducats were first struck by the Byzantine emperors in the eleventh century, or, according to some authorities, a century later, in Sicily. The name is said to have originated from the legend found on early Sicilian pieces, *Sit tibi, Christe, datus, quem tu regis, iste Ducatus* ("Be intrusted to thee, Christ, this duchy (*Ducatus*) of which Thou art ruler"). Especially famous were the golden ducats of Venice, known as *zecchini* or sequins. Later, Holland, the German Empire, Russia, and the States of the north began the striking of ducats. At present there are practically none of these coins in existence, outside of collectors' cabinets. The value of the principal ducats formerly in circulation ranged from $1.46 for the Venetian to $2.32 for the Spanish and Hanoverian coin; the usual value was $2.32. Venice and the Two Sicilies struck also silver ducats of the value of $0.83 approximately, and Spain issued silver ducats varying in value from $0.90 to $1.10. In Austria-Hungary gold ducats are still coined, chiefly for the purposes of foreign trade, especially in the Levant. Quadruple ducats also are struck.

DUCCIO DI BUONINSEGNA, d͞oo'chô dê bwō'nên-sȧ'nyȧ (c.1260-1320). An Italian painter, founder of the Sienese school. Little is known of his career. He was born in Siena, where he passed most of his life. He was in Florence in 1285, we learn from public documents of the time, and received an order to paint an altar-piece for Santa Maria Novella, which he probably never fulfilled. After his return to Siena he appears to have executed a "Majesty," of which there is no record, and in 1308 he began his great work, the high altar in the Duomo. There are records showing this to have been a special order from Mariscotti, master of the work on the cathedral. When the picture was completed in 1310, the entire city celebrated a fête. It was carried, like the famous Madonna of Cimabue, from his studio to the cathedral, accompanied by a great procession of citizens and clergy in gala dress. The picture is fourteen feet long, and seven high; the faces represented are those of the Virgin and Child surrounded by angels, saints, and bishops of the Church. On the reverse is shown in twenty-six compartments the Passion of Christ, with a background of gold. The figures in this series are animated and the groups show dramatic feeling. Like Giotto, with whom he can be compared, Duccio was a reformer and an innovator. Under his brush, the stiff Byzantine figures took on grace and life, though he departed little from the traditional models. His drawing was correct and dignified; he loved detail and ornament, and he tried to produce soft and pleasing color. In this work Duccio established certain characteristics which came to be identified with the Siennese school for more than a century. The picture has since been divided into several panels, but it remains in the cathedral. There are two Madonnas by Duccio in the Academy of Siena, and a good example of his work at Windsor, and in the National Gallery in London, both Madonnas, and figures of saints in the Rambona collection in Cologne. Consult Crowe and Cavalcaselle, *A History of Painting in Italy*, vol. ii. (London, 1864).

DU CERCEAU, dụ sâr'sō'. See ANDROUET DU CERCEAU.

DU'CEY, THOMAS JAMES (1843—). An American Catholic clergyman. He was born at Lismore, Ireland, and was brought to the United States in early childhood, and was educated at the College of Saint Francis Xavier, in New York City. In 1880 he became pastor of Saint Leo's Church, which was founded by him in that year. Besides being distinguished as a philanthropist, he is widely known as a promoter of civic reform. He has spent large sums of money upon his church, in connection with which a building called 'Saint Leo's Repose for the Dead' was established in 1899 as a temporary resting-place for the bodies of strangers who die in New York City.

DU CHAILLU, dụ shȧ'yụ', PAUL BELLONI (1835-1903). An African explorer and author. He was born in New Orleans, La., of French Huguenot parentage, and was educated in Paris.

He went at an early age to Africa, where his father was established as a trader in the Gabun country. Young Du Chaillu familiarized himself with the language and customs of the neighboring coast tribes, and after three years spent in America, set out, in 1855, upon an exploring expedition into the interior of equatorial Africa. He spent nearly four years in his explorations, and his discoveries added greatly to the knowledge of the flora and fauna of Africa, although, because of their rather remarkable character, the truth of his accounts was scouted by scientists at the time. Besides being the first white man to observe and obtain specimens of the gorilla, he secured sixty hitherto unknown species of birds, and accumulated much valuable information as to the life and customs of the almost unknown tribes of pygmies in the interior of the continent. His published account of his explorations and discoveries, *Explorations and Adventures in Equatorial Africa* (1861), met with a storm of ridicule and refutation. In order to further substantiate his statements, he made a second journey into equatorial Africa in 1863, where he remained until 1865 and added to his previous discoveries. His experiences on his second expedition are detailed in *A Journey to Ashango Land* (1867). In 1872-73 he made explorations in Norway, Sweden, Lapland, and Finland; and in 1898-1902 traveled through Russia. His published works, besides those named above, include: *The Gorilla Country* (1868); *Wild Life Under the Equator* (1869); *Lost in the Jungle* (1869); *My Apingi Kingdom* (1870); *The Country of the Dwarfs* (1870); *The Land of the Midnight Sun* (1881); *The Viking Age* (2 vols., 1889); *The Land of the Long Night* (1900); and *The World of the Great Forest* (1900).

DUCHATEL, dụ'shȧ'tĕl', CHARLES MARIE TANNEGUI, Count (1803-67). A French statesman, born in Paris. He became Minister of Agriculture and Commerce in 1834 and in 1839 and 1840, successively, Minister of the Interior in the Soult and Guizot Cabinets. His most important work, based upon a careful study of the theories of Malthus, is entitled *Traité de la charité dans ses rapports avec l'état moral*, etc. (1829; 2d ed., under the title *Considérations d'économic politique*). The *documents statistiques sur la France* (1834) are valuable. The principal achievement of Duchatel as a legislator was the complete reformation of the tariff laws.

DUCHÉ, dụ'shȧ', JACOB (1737-98). An American clergyman and writer. He was born in Philadelphia of Huguenot parentage; was a member of the first class which graduated (1757) at the College of Philadelphia (now the University of Pennsylvania); studied for a time at Cambridge University, England, and in 1775 became rector of the united parishes of Christ Church and Saint Peter's, Philadelphia. On the approach of the Revolutionary War, he joined the Whig or Patriot party, and on September 7, 1774, made the opening prayer before the Continental Congress then assembled in Carpenter's Hall, Philadelphia. John Adams, writing a few days later, said: "I must confess I never heard a better prayer or one so well pronounced. Dr. Cooper himself never prayed with such fervor, such ardor, such earnestness and pathos, and in language so elegant and sublime for America, for the Congress, for the province of Massachusetts Bay, and especially the town of Boston." For three months after the passage of the Declaration of Independence he acted as chaplain to Congress, but when the English gained possession of Philadelphia, he abandoned the Whig cause and in October, 1777, wrote his well-known letter to Washington, urging him "to represent to Congress the indispensable necessity of rescinding the hasty and ill-advised Declaration of Independency" and, that failing, to "negotiate for your country at the head of your army." The letter becoming public, and much indignation being aroused against Duché, he went to England, where he soon attracted attention by his eloquence, and acted as chaplain to the Lambeth Orphan Asylum until 1790, when he came back to Philadelphia. Besides a number of occasional sermons, he published *Observations on a Variety of Subjects, Literary, Moral, and Religious, in a Series of Letters written by a Gentleman of Foreign Extraction, who resided some Time in Philadelphia* (Philadelphia, 1774), a book of some merit which became widely popular, was frequently republished, and is best known under the title *Caspipina's Letters*. He also published *Discourses on Various Subjects* (London, 1779), which passed into several editions. Consult a brief sketch in Tyler, *Literary History of the American Revolution* (New York, 1897).

DUCHENNE, dụ'shĕn', GUILLAUME BENJAMIN (1806-75). A French physician, called "Duchenne de Boulogne," born at Boulogne-sur-Mer, and educated in Paris. Here he became established in 1842, and soon acquired fame as an investigator in electric diagnosis and electrotherapeutics, of which science he is sometimes considered the founder. He was a pioneer in the localization of the electric current and its adaptation in determining the physiology of the various muscles of the body. Scarcely less important were his researches on the pathology of the nervous system. His numerous publications include: *De l'électrisation localisée et de son application à la pathologie et à la thérapeutique* (3d ed. 1872); *Mécanisme de la physionomie humaine, ou analyse électro-physiologique de l'expression des passions* (with 72 photographic illustrations, 1862); *Physiologie des mouvements*, etc. (1867).

DUCHESNE, dụ'shȧn', ANDRÉ (in Latin, ANDREAS CHESNIUS, DUCHENIUS, or QUERCETANUS) (1584-1640). A French historian. He was born in Touraine, and studied in London and Paris. Under Richelieu's Ministry he was appointed royal geographer and historiographer. Among his writings were: *Historiæ Francorum Scriptores Coætanei ab ipsius Gentis Origine ad Philippi IV. Tempora* (5 vols., 1636-49; vols. 3-5 were written by his son, François Duchesne); *Historiæ Normannorum Scriptores Antiqui* (1619); *Histoire généalogique de la maison de Montmorency et de Laval* (1624); *Histoire généalogique de la maison de Vergy* (1625); and *Histoire généalogique de la maison de Guiches* (1631).

DUCHESNE, JACQUES CHARLES RENÉ ACHILLE (1837—). A French soldier. He was born in Sens, France. He distinguished himself in the Franco-Prussian war in 1870-71, in Tongking in 1883; became a general of brigade in 1888 and of division in 1893, and in 1895 was commandant of the expedition which conquered Madagascar. He became general of division and a member of the Superior Council of War (1900).

DUCHESNE, Père. See Hébert, Jacques René.

DUCHESNOIS, dụ'shȧ'nwä', Catherine Joséphine (properly Rafin) (1777-1835). A French actress, born at Saint Saulves (Nord). She made her début at the Comédie Française in Racine's *Phèdre*. She was received with enthusiasm and for five years was the favorite of the Parisian public. Then the beautiful Mlle. Georges appeared and the two actresses began an active rivalry which was taken up by the press. The wife of the First Consul, Joséphine Beauharnais, took the part of Mlle. Duchesnois, and she was made a *sociétaire* in 1804. In 1832 she retired from the stage. The plays in which she created rôles are *La mort de Henri IV.*, by Legouvé; *Hector*, by Luce de Lancival; *Mahomet II.*, by Baour-Lormian; and *Ulysse*, by Lebrun.

DUCHESS, The. See Hungerford, Margaret.

DUCHESS OF DEV'ONSHIRE. The subject of two noted paintings: one, by Sir Joshua Reynolds, in the gallery at Althorp Park; the other, by Gainsborough, in the New British Institution, London, stolen in 1876, but recovered in 1902.

DUCHESS OF MAL'FI, The. A tragedy by John Webster. Its plot is based on the secret marriage of the title-character with her steward and the fate forced upon her by the subsequent goadings of her pitiless family. The chief source of the play is one of Bandello's *Novelle*. It was produced about 1612, printed in 1623, and is considered the author's finest dramatic achievement.

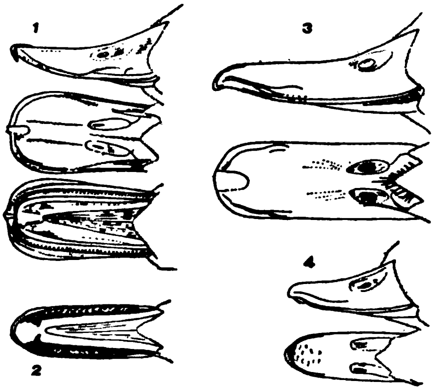
DUCHINSKI, dụ-kēn'skē, Henryk Franciszek (1816-93). A Polish historian and ethnographer, born in the Ukraine. He studied at the lyceum of Berditchev, in 1848 assisted in founding the Società Italo-Slava, and was for a time interpreter to Achmet Pasha, Prince of Kurdistan. He received naturalization papers from Switzerland for his services to science. His works, devoted chiefly to the exposition of the thesis that Poland and Russia are fundamentally different in origin and character, include *Panslavism* (1854); *The Beginnings of the History of Poland and of Other Slavic Peoples* (1858-63); and *Aryan and Turanian Peoples* (1864).

DUCIS, dụ'sē'. Jean François (1733-1816). A French dramatic poet, born in Versailles, chiefly noteworthy as an adapter to the French stage of Shakespeare's *Hamlet* (1767); *Romeo and Juliet* (1772); *Lear* and *Macbeth* (1783); and *Othello* (1792). He succeeded Voltaire in the French Academy (1779). His independent dramatic efforts were failures, but his adaptations of English models paved the way for the more daring innovations of Lemercier and the Romantic School. Ducis wrote also negligible poetry. His works were collected in 6 vols. (1827). His *Hamlet, Macbeth,* and two other plays are in Didot's *Chefs-d'œuvres tragiques* (vol. 2). Consult: Jusserand, *Shakespeare en France* (Paris, 1898); and Lacroix, *Histoire de l'influence de Shakespeare* (Brussels, 1856).

DUCK (AS. *dūce,* connected with OHG. *tūhhan,* Ger. *tauchen,* to dive). The ducks are a large and well-defined group of birds of the order Anseres (q.v.) and the family Anatidæ. They are distinguished from the swans and geese by having the tarsi scutellate in front and the sexes are unlike in color; and they are separated from the mergansers by the shape of the bill, which is broad and flattened. The ducks are largely animal feeders (insects, snails, frogs, fish, etc.), although some species are noted for their fondness for wild celery and some other vegetables. The legs are short and placed far back, so that ducks move with difficulty on land, and with the characteristic gait known as a 'waddle,' but they are splendid swimmers, and are noted for their powers of diving and swimming under water. The neck is short as compared with geese or swans. There is a peculiar anatomical feature of the windpipe, consisting of a large dilatation of the trachea on each side at its bifurcation. The tongue is large and fleshy and very sensitive. The plumage is remarkably thick, soft, and compact. The wings are stiff, strong, and pointed, giving the power of rapid and vigorous flight, though the speed of wild ducks has probably been exaggerated. The tail is of variable shape and made up usually of 14 or 16 feathers. The oil-gland is always present and well developed, with two openings and crowned with a tuft of feathers. The ducks have been easily tamed, and many breeds are known which will be considered later by themselves.

Wild Ducks. The ducks are easily divisible into two groups, one of which is usually spoken of as river-ducks (*Anatinæ*), and the other as sea-ducks (*Fuligulinæ*). The latter have an evident lobe or web on the hind toe, which is wanting in the river-ducks. These subfamilies are by no means confined to the bodies of water, which might be inferred by the names, for many of the sea-ducks are abundant on our large inland lakes and rivers, while some of the river-ducks are common 'along shore.' The sea-ducks obtain their food principally by diving for it, sometimes descending, it is said, more than 150 feet; they feed by day and pass the night at some distance from the shore. The river-ducks, on the other hand, feed more commonly at night and rarely dive for their food, but obtain it in shallow water by probing on the bottom. The river-ducks are seldom seen in flocks of more than fifty, while the sea-ducks often gather in enormous flocks.

There are something like sixty-five or seventy species of river-duck known, occurring pretty generally throughout the world, about a dozen being found in the United States. The best known species is the common mallard (*Anas boschas*), which occurs in nearly all parts of the Northern Hemisphere and is undoubtedly the parent form of the domesticated duck. In the United States it is far more common in the interior than on the coasts; and it is rare in New England, where it is replaced by the dusky or black duck (*Anas obscura*). The latter is found throughout eastern North America and is the commonest river-duck of the New England States. It is about the size of the mallard, but the general color is dusky brown and the sexes are nearly alike. The lining of the wings is white. The nest is on the ground, of weeds, grass, and feathers; the eggs are eight to ten in number, dirty yellowish drab. Like the other river-ducks, the black duck is fine game and is highly esteemed for the table. By far the handsomest of America's river-ducks is the beautiful wood or summer duck (*Aix sponsa*), described under **Wood-Duck**. Another species of the same genus, the mandarin duck (*Aix galericulata*) of China, is still more remarkably adorned, though it is not perhaps any handsomer. Other well known river-ducks are the gadwalls, widgeons, shovelers, pintails, and teals, all of which are treated of in the proper places.



BILLS OF REPRESENTATIVE DUCKS.

1. Ruddy duck (*Erismatura rubida*), from the side, from above and from below. 2. Widgeon (*Mareca Americana*), from below showing double pectinations. 3. Mallard (*Anas boschas*), from the side and from above. 4. Bufflehead (*Charitonetta albeola*), from the side and from above.

Of the sea-ducks, perhaps fifty or sixty species are known, widely distributed in all parts of the world, of which two dozen occur in North America, but comparatively few in the Southern Hemisphere. As a rule they are not so good eating as the river-ducks, as the flesh is so much coarser and is often rank. But there are some notable exceptions, such as the well-known canvasback (*Aythya vallisneria*), (q.v.), which is found in suitable localities and at the proper seasons throughout North America. Allied to these are the scaups (q.v.) and the ring-necked duck (*Aythya collaris*), which has a chestnut band around the black neck of the male. The 'old-squaw' (*Clangula hyemalis*) is a very striking species, which breeds in Arctic regions and winters in the United States as far south as Virginia, and also in Europe and Asia. It is easily recognized by the greatly elongated middle pair of tail-feathers. A very interesting duck, now believed to be extinct, is the Labrador duck (*Camptolæmus Labradorius*), which formerly occurred on the North Atlantic coast as far south as Long Island. (See **Extinct Animals**.) The ruddy duck (*Erismatura rubida*) is a small and interesting duck, about fifteen inches long, with the throat and back rufous chestnut and the breast and belly white. The most striking characteristic is the peculiar tail; the coverts are very short and the stiff and pointed tail-feathers are bare to their bases. The ruddy duck is found from northern South America northward to Hudson's Bay, and is chiefly migratory in the United States. Closely related to it is the curious masked duck (*Nomonyx Dominicus*) of tropical America, which is hardly more than a foot long. A very remarkable South American duck is the so-called steamer-duck (*Micropterus cinereus*), the adult of which has lost the power of flight on account of the small size of the wings, but it is an expert swimmer. Its movements are so peculiar, however, as to suggest a side-wheel steamer, whence the name. The so-called 'tree-ducks' of the warmer parts of America are in reality geese, though the scientific name of the genus, Dendrocygna, literally means 'tree-swan.' See, also: **Broadbill**; **Golden-Eye**; **Eider**; **Scoter**; **Merganser**, etc.; and other names of ducks; see, also, for the capture of ducks, **Decoy** and **Trapping**; and for duck-shooting as a sport, see **Hunting**.

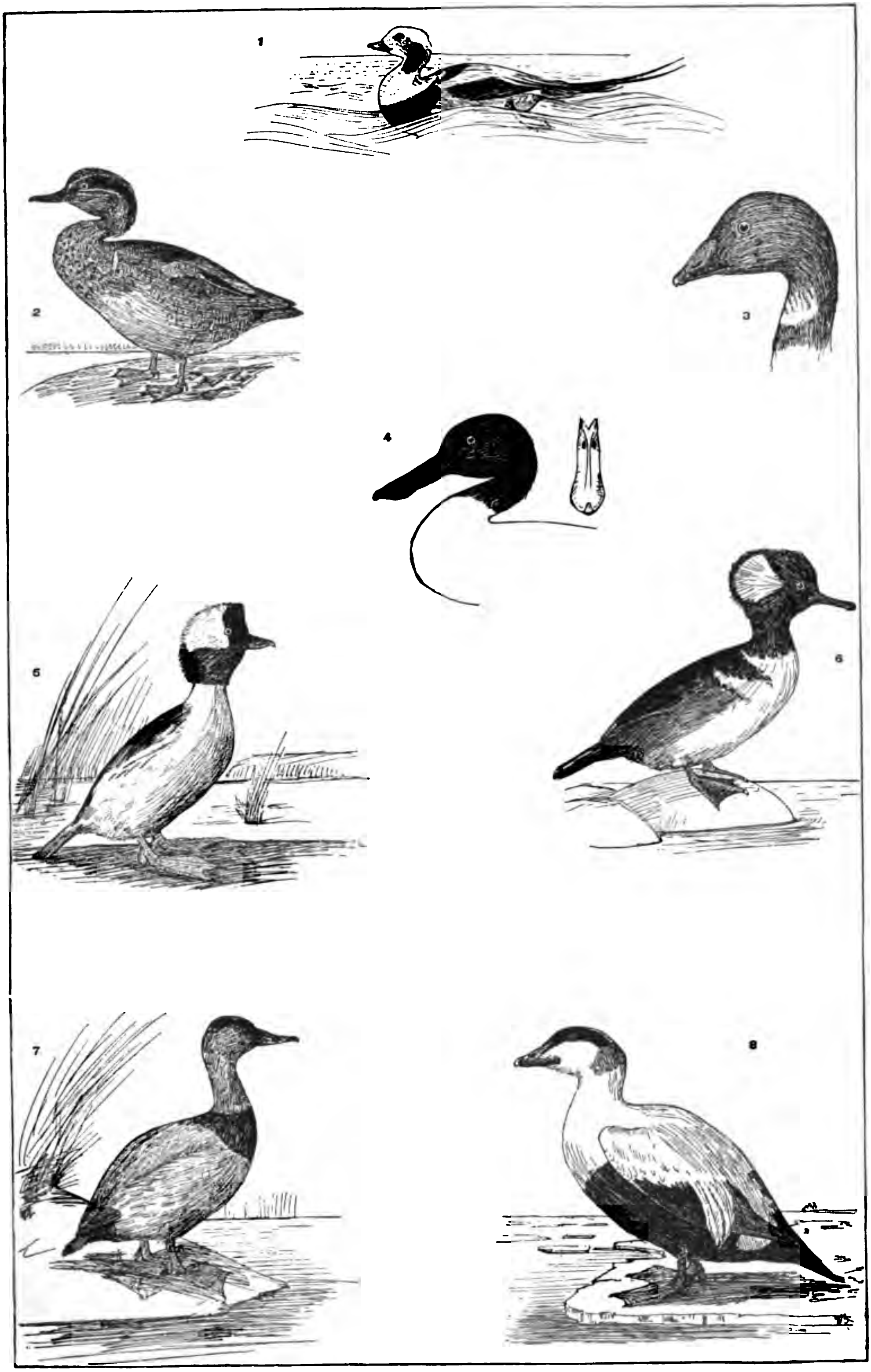
Domestic Ducks. Ten standard breeds of domestic ducks are raised in the United States: The white Pekin, white Aylesbury, colored Rouen, black Cayuga, colored Muscovy, white Muscovy, gray call, white call, black East Indian, and the crested white. Of these breeds the first six are considered profitable to raise; the two breeds of calls and the black East Indian are bantams and are bred more for the showroom; the crested white may be considered as almost purely ornamental. See Colored Plate of **Ducks**.

The Pekin duck, which leads in popularity, was introduced from China since 1870. It is a distinct type. Both male and female of standard-breed specimens have a pure yellow bill, white or cream-white plumage, and lead-colored eyes. The neck of a Pekin should be gracefully curved; in the drake it should be large and rather long, while that of the duck is of medium length. The back is long and broad; the breast round, full, and very prominent. The body is long and deep, and the standard for adult birds is a body approaching in outline a parallelogram. The wings are short, carried closely and smoothly against the body. The tail is erect, more so than in any other breed. The curled feathers in the tail of the drakes are hard and stiff. These ducks are very large, some reaching as high as twenty pounds to the pair. Their flesh is very delicate and free from grossness, and they are considered among the best of table fowls. They are excellent egg-layers, averaging from 100 to 130 eggs each in a season.

The white Aylesbury ducks are also popular for market purposes, especially in England and the Continent of Europe. These ducks have white, soft plumage, a long wide bill of a pale flesh or pinkish color; the slender neck is long and gracefully curved, and the body is long and oval. The other breeds differ more or less from the two mentioned above and are characterized by their form, color, size, etc. The colored Rouens and Muscovys have ornamental plumage. The Muscovy drake has a crest, as do also both male and female of the crested white duck.

Duck-raising has been developed in the United States into a flourishing industry. Not many years ago the duck was considered an unprofitable fowl to raise; its flesh was never prized very highly by the masses. Ducks were raised without constraint in waterways, feeding mostly on fish and water insects. This food gave the flesh a strong fishy flavor; hence it was not particularly sought after, save by the few who were partial to that class of diet. When carefully fattened this flavor is not noticeable. Artificial incubation and brooding, combined with judicious feeding, have been instrumental in the development of the industry. The season for raising ducks is about six months in length, i.e. from February to July. The food of the duck is both animal and vegetable

NORTH AMERICAN WILD DUCKS



1. OLD SQUAW (Clangula hyemalis).
2. GREEN-WINGED TEAL (Anas Carolinensis).
3. BRANT GOOSE (Branta bernicia).
4. AMERICAN BROADBILL (Spatula clypeata).
5. BUFFLEHEAD (Charltonetta albeola).
6. HOODED MERGANSER (Lophodytes cucullatus).
7. CANVASBACK (Aythya vallisneria).
8. AMERICAN EIDER (Somateria Dresseri).

in nature. In the wild state it gathers its food, consisting of flag, grasses, small fishes, water insects, etc., from brooks and marshes. When the birds are raised in confinement this diet must, in a measure, be imitated to get the most satisfactory results. Such foods as wheat-bran, corn-meal, and beef-scrap, mixed with water to a mush, with grit and green food, constitute the most satisfactory diet. The food must be in a soft mushy state. Too much hard food, such as grain, does not agree with these birds and they cannot thrive on it. While some raisers use a small allowance of grain, others do not, and it has not been proved to be of any advantage to feed it. It has been estimated that it costs from 6 to 12 cents a pound to raise a duck for market at ten weeks of age. The cost of feed is from 4½ to 5 cents a pound, and that of labor, etc., is from 4 to 8 cents a pound. It costs from $1.75 to $2.50 each to keep breeding ducks a year. When ducks are raised for breeders they are fed differently from those intended for market. They are not forced as much as are the latter, and less fattening food is given them. To raise ducks successfully, it is not at all necessary that they should have access to water, except for drinking purposes; they grow and thrive as readily without. There are successful duck farms where thousands of ducks are raised without access to water, save that which is given them as drink. It has been a matter of much dispute which is the better way. As food, ducks are much prized, their flesh having a very agreeable flavor, when properly fattened. Ducks' eggs are larger than hens' eggs, but resemble them closely in composition. They are much used as food, especially in Europe.

The species most nearly allied to the common duck is said to be the Javanese duck (*Anas Javanensis*), nearly allied to the mallard.

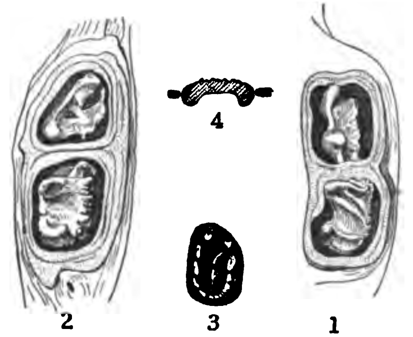
BIBLIOGRAPHY. Consult: Howard, "Ducks and Geese," in United States Department of Agriculture, *Farmer's Bulletin 64* (Washington, 1897); Yorke, *Our Ducks* (Chicago, 1900), a history of American ducks; Hehn, *Cultivated Plants and Domestic Animals* (translated by Stallybrass, London, 1891). For wild ducks: Consult the authorities referred to under BIRDS, especially those books relating to northern latitudes. More special works of popular interest are Elliot, *Wild Fowl of North America* (New York, 1898); Morris, *British Game-birds and Wild-Fowl* (London, 1891); Lloyd, *Game-Birds and Wild-Fowl of Sweden and Norway* (London, 1867); Job, *Among the Water-Fowl*, descriptions and photographic illustrations of breeding habits (New York, 1902).

DUCK (Dutch *doek*, towel, Icel. *dūkr*, Ger. *Tuch*, cloth, Goth. *gadauka*, table-companion). An untwilled fabric of cotton or linen, not so heavy as canvas, but used for similar purposes. (See CANVAS.) The lighter and finer grades are used for women's and children's suits.

DUCK-ANT. The local name in Jamaica for the white ant or termite. See TERMITE.

DUCKBILL, or PLAT'YPUS. An aquatic, egg-laying mammal of the order Monotremata, of which only one species (*Ornithorhynchus paradoxus*) is known. It inhabits the rivers of Australia, Papua, and Tasmania. The first descriptions of this singular quadruped were received with incredulity, and even when a stuffed specimen was brought to England, it was suspected to have been ingeniously fabricated. The whole length, including bill and tail, is usually from 18 to 20 inches. The body is rather long and depressed, the skin loose and thickly covered with glossy hair, among the roots of which there is a layer of soft short waterproof fur like that of a beaver. The head is small and round, with small bright eyes, and no external ears, although the internal ears are perfectly developed, and the hearing acute; and instead of the muzzle, mouth, and teeth of an ordinary quadruped, the creature is furnished with a bill like that of a duck, but broader in proportion. This incloses the long upper and lower jaws within an extremely sensitive naked skin, grayish in color, which is mostly attached to the underlying bones, but possesses a flexible, lip-like border all round the mouth, and is raised into a frill-like fold round the base of the bill, which, in burrowing and searching for food in the mud, is turned back so as to protect the eyes. The nostrils are situated at the extremity of the upper mandible, so that the animal need only thrust the tip of its nose out of water in order to breathe. The lower mandible has transverse lamellæ, somewhat like the bill of a duck, and each jaw is furnished with two pairs of horny plates ('cornules'), the forward ones like sharp ridges, while those behind are broad and flattened. These serve the purpose of teeth for the adults; but true cheek-teeth are present in young animals (see *Proceedings of the Royal Society of London*, vols. xliii., 1888; and xliv., 1889), which "are functional for a considerable part of the life of the animal, cutting the gum in the usual manner, and, after being worn

THE DUCKBILL.



DENTITION OF DUCKBILL.

1. Left upper teeth, the ring of indurated epithelium still present. 2. Left lower teeth. 3. A similar fossil tooth of Microlestes (q.v.). 4. Diagrammatic section of a fully developed cornule.

down by friction with food and sand, are shed from the mouth in the same manner as are the milk-teeth of other mammals." The corneous ridges grow up around them and take their place. These facts are regarded as evidence that the duckbill descended from ancestors provided with persistent teeth of the ordinary kind. The tongue is small, non-extensile, partly covered with horny spines, and "has a projection toward its hinder part which serves to direct the food collected into two large cheek-pouches" where it can be stored and conveniently carried to the burrow or some other comfortable eating-place.

The duckbill is aquatic and a burrower, and its skeleton shows adaptation to these habits in the great strength of the bones of the limbs and of the pectoral girdle. The legs are short, the fore feet have each five toes, with strong burrowing claws, and a connecting membrane for swimming, which extends even beyond the claws, but is capable of being folded back, so as not to impede their use in burrowing. The hind feet are smaller than the fore feet; they have each five toes armed with claws, and webbed, but the web does not extend beyond the base of the claws. The tail is strong, broad, and flattened, about half as long as the body, covered with longer and coarser hairs, and nearly naked on its under surface. An interesting feature is the strong horny spurs on the heels of the male, which are movable and traversed by a minute canal opening at the point, and connected at the base with the duct from a large gland at the back part of the thigh. The popular belief that these spurs were venomous, to which this fang-like structure gave support, has been confirmed by the record of a case by Spicer ("On the effects of wounds on the human subject inflicted by the spurs of the platypus," in *Proceedings of the Royal Society of Tasmania*, Hobart Town, 1876), of a man who suffered precisely as if locally poisoned, following a wound from the spurs of a captive duckbill. However, as the male alone possesses these appendages, they are probably used mainly in the combats of the nuptial season.

Habits. The duckbill is as thoroughly aquatic as a beaver, spending its whole life in or near rivers, but not frequenting stagnant pools nor brackish estuaries. It swims chiefly by flipper-like movements of the webbed fore feet, and dives with ease and grace. It is somewhat gregarious, but so shy as rarely to be seen even where numerous, unless quietly watched for at evening, when they "look like so many black bottles floating on the surface, and sink down directly if alarmed." Each pair digs and occupies a burrow in the bank, having usually one opening beneath the water and another above it, which may run irregularly away and upward from the stream for ten or fifteen yards before it suits the owners to enlarge it into a chamber bedded with dry grass, where they sleep, rolled up in a ball, most of the day, and where the young are produced. The evil smell of these burrows is notorious in Australia. These animals rarely go ashore, and when they do so waddle about with a curious slipshod gait; yet those in captivity, where they exhibit docility and intelligence, climb about the furniture of a room with surprising agility. "The food consists of aquatic insects, small crustaceans and worms, which are caught under water, the sand and small stones at the bottom being turned over with the bill. The creatures appear at first to deposit what they have thus collected in their cheek-pouches, and when these are filled they rise to the surface and quietly triturate their meal with the horny plates before swallowing it." This food is discovered in the mud not only by an extreme sensitiveness to touch of the margin of the bill, but by smell, of which those studied in captivity show a remarkably high development. The eyes are small and half hidden, but perfect and useful. The duckbill's voice resembles the growl of a young puppy, but the animal's disposition is gentle.

Oviparous Reproduction. The duckbill, like other monotremes, actually lays eggs from which the young are hatched—a fact long disputed, and doubtfully believed by the aborigines, who were well acquainted with the haunts and habits of the animal, which they sought both as food and for its skin. The eggs are white, three-fourths of an inch long by one-half an inch broad, the shell is soft and flexible, and they contain a large amount of food-yolk, as in birds' eggs. Only a few eggs are laid at a time, often only one, and it is hatched very soon after it is laid. The mother has no nipples, but has milk-glands opening into little pits so that the young seem to be suckled by the ejection of the milk into their mouths, which in this early stage are smooth and fleshy. The young are blind and naked at birth.

Bibliography. Besides the treatises mentioned above, consult various articles by Owen in the *Transactions* of the Philosophical and Zoölogical Societies of London (London, 1832-34); Flower and Lydekker, *Mammals, Living and Extinct* (London, 1891); Bennett, *Transactions of the Zoölogical Society of London* (London, 1835); Bennett, *Gatherings of a Naturalist in Australia* (London, 1866). See Monotreme; and compare Echidna.

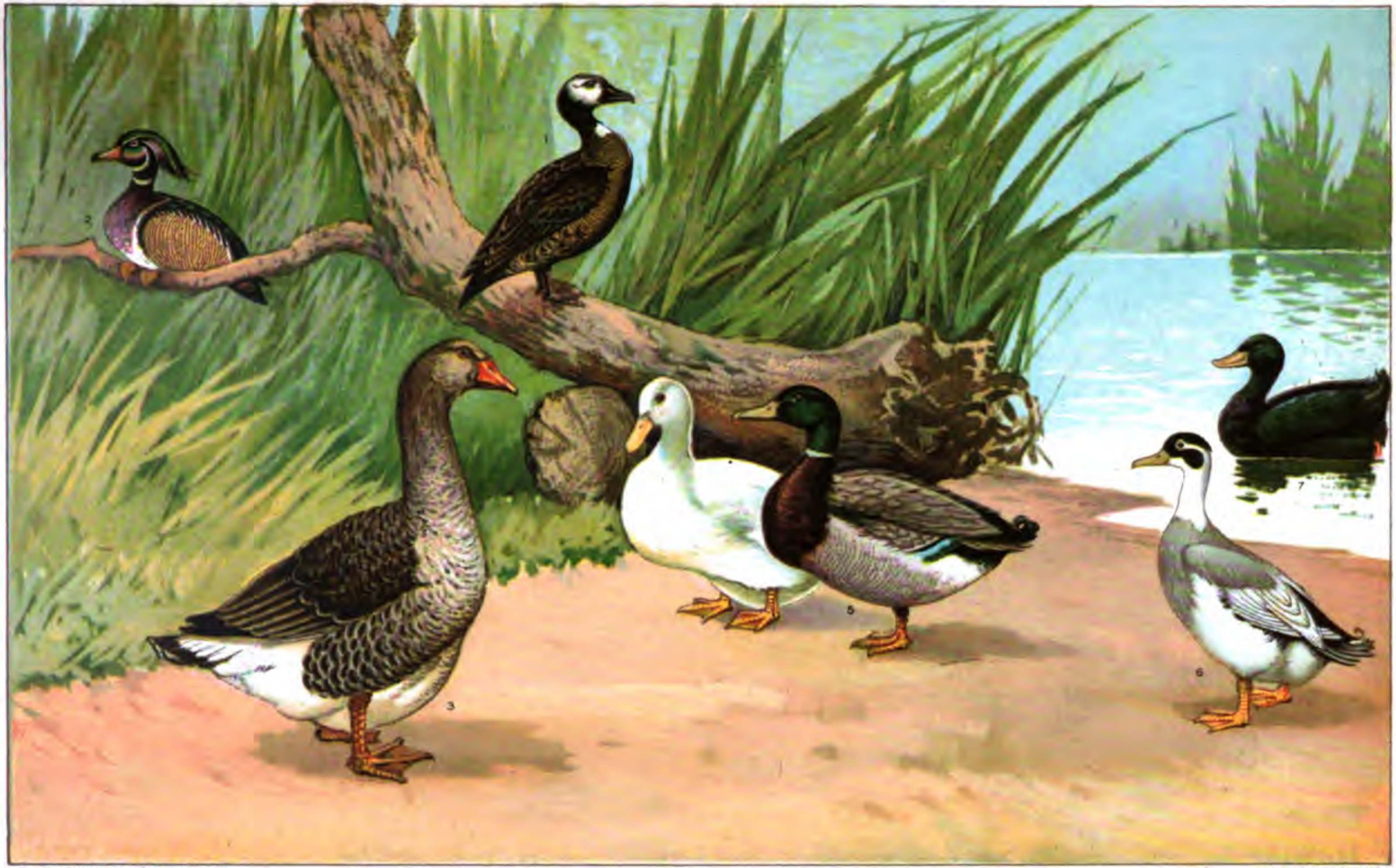
DUCK-BILLED CAT. See Paddle-Fish.

DUCK-HAWK. The peregrine. See Falcon.

DUCKING-STOOL. A rude device, formerly in use in Great Britain and in parts of the United States, for the punishment of common scolds (q.v.). It consisted of a rough, strong chair attached to one end of a beam, which worked on a pivot on a post at the edge of a pond or stream of water. The woman was placed in the chair with her arms drawn backward; a bar was placed across her back and in front of her elbows, another bar held her upright, and there were cords to tie her securely in. The executors of the punishment then took hold of a chain at the opposite end, and gave her a ducking on the 'see-saw' principle. A ducking-stool was in use for actual ducking at Leominster as late as 1809.

DUCKWITZ, dųk′vīts, Arnold (1802-81). A German politician. He was born in Bremen, where, after travels through England and the Netherlands, he became distinguished as the foremost promoter of ship-building and navigation in Germany. He strongly advised the creation of a German customs union, and the harbor improvements of Bremen were also due largely to his initiative. The innovations were followed by the establishment of a steamship line between Bremen and New York, and the conclusion of a favorable postal treaty with the United States. As Imperial Minister of Commerce and Naval Affairs, to which positions he

DUCKS



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

1 WHITE FACED WHISTLING DUCK (DRAKE)
2 SUMMER, CAROLINA OR WOOD DUCK (DRAKE)
3 TOULOUSE GOOSE (GANDER)
4 AYLESBURY DUCK (DRAKE)
5 ROUEN DUCK (DRAKE)
6 INDIAN RUNNER DUCK (DRAKE)
7 BLACK EAST INDIAN DUCK (DRAKE)

had been appointed in 1848, he promoted the construction of the war-vessels which constituted the German navy of the time. In May, 1849, he returned to his native city; in 1857 he was elected burgomaster and served for six years, his reëlection to that office following in 1866. In 1873 he retired from public life. His principal publication is entitled *Denkwürdigkeiten aus meinem öffentlichen Leben 1841-66* (1877).

DUCKWORTH, Sir John Thomas (1748-1817). An English naval officer, born at Leatherhead (Surrey). He entered the British Navy in 1759; in 1777 accompanied the frigate *Diamond* to North America as a first lieutenant, and later served under Admiral Byron in the West Indies. During the war with France he commanded the *Orion* of the Channel Fleet, and in 1798 he directed the naval operations attending the capture of Minorca. He was promoted to be rear-admiral of the white in 1799, a vice-admiral in 1804, and served in various capacities in the Mediterranean and the West Indies. In 1805 he was assigned to the direction of the blockade of Cadiz, and on February 6, 1806, with seven battle-ships of the line, two frigates, and two sloops, thoroughly defeated a French squadron of five battle-ships and three frigates off San Domingo. He was sent in 1807 to dictate terms to the Porte. His orders proved impossible of execution; his negotiations resulted in nothing, and the Turks, advised by the French, having strengthened the shore batteries of the Dardanelles, he retreated. His action was much discussed. From 1810, in which year he became admiral, until 1813 he was Governor and commander-in-chief of Newfoundland.

DUCLERC, du'klârk', Charles Théodore Eugène (1813-88). A French statesman. He was for some time a proof-reader for *Le Bon Sens* (Paris), of which he became the editor in 1836. From 1840 to 1846 he was on the staff of the *National*, to which he contributed financial articles. The events of 1848 brought him into political life, and he served as Minister of Finance for a short time. From 1871 to 1875 he was a member of the National Assembly, and in 1875 was elected its vice-president. In the same year he was chosen Senator for life. In 1882 he succeeded Freycinet as Premier, but resigned in 1883, owing to his disapproval of the policy of expelling the princes from the Republic.

DUCLOS, dṳ'klō', Charles Pinot (1704-72). A French historian, philologist, novelist, and wit, *droit et adroit*, as Rousseau epigrammatically described him. He was born at Dinan. His youthful frivolous tales were followed by the judicial *Histoire de Louis XI.* (1745), the sound and ingenious *Considérations sur les mœurs de ce siècle* (1749), and the celebrated *Mémoires secrets sur le règne de Louis XIV., la Régence et le règne de Louis XV.* (1791), among the best and most curious of the time. Duclos aided in revising the *Dictionnaire* of the Academy, of which body he was made perpetual secretary in 1755. His *Œuvres complètes* (10 vols., Paris, 1806) include an incomplete autobiography.

DUCORNET, du'kôr'nā', Louis César Joseph (1806-59). A French historical and portrait painter, chiefly celebrated for the natural deformities which he overcame in order to paint. He had no arms and his legs were deformed. He used the brush with his feet. He studied at Lille, his native town, which furnished him with a pension to enable him to continue his studies in Paris under Lethère. His pictures are of some merit, and he belongs to the second-class artists of the Romantic School. Among his chief works are the "Slave Merchant," in the Museum of Arras, a portrait of General Negrier, and the "Parting of Hector from Andromache," in the Museum of Lille, and "Edith Finding the Body of Harold" (1855).

DUCOS, dṳ'kō', Pierre Roger, Count (1754-1816). A French statesman, born at Dax (Landes). In 1792 he was elected Deputy from Landes to the National Convention, where he voted for the execution of Louis XVI. After acting as president of the Jacobin Club (1794), he became a member of the Council of Five Hundred, and was chairman of that body, September 4, 1797, when the decree of deportation was issued against the Royalists. He was an ardent follower of Sieyès, through whose influence he became a member of the Directory. After the coup d'état of the Eighteenth Brumaire, he became a member of the Consulate with Bonaparte and Sieyès, and subsequently was vice-president of the Senate. After the Second Restoration he fled to Germany. He was killed near Ulm through the upsetting of his carriage.

DUCOUDRAY, dṳ'ko͞o'drâ', Gustave (1838—). A French scholar and historian. He was born at Sens (Yonne), studied at the Lycée Henri IV., and the Ecole Normale Supérieure, and was connected with the Cabinet of M. Duruy when the latter became Minister of Public Instruction. Subsequently he became professor of history and geography at the Ecole Normale de Saint Cloud. His publications include, besides a series of text-books for school use, *Cent récits d'histoire de France* (1878); *Cent récits d'histoire de France contemporaine* (1881); *Histoire sommaire de la civilisation depuis l'origine jusqu'à nos jours* (1886).

DUCPÉTIAUX, dṳk'pâ'tē'ō', Edouard (1804-68). A Belgian publicist, born in Brussels, where he devoted himself to the practice of law. He participated in the Revolution of 1830, and was subsequently appointed chief inspector of the prisons and benevolent institutions of the country, which position he held until 1861. He was long a collaborator on the *Courrier des Pays-Bas*, and was one of the foremost promoters of prison reform in Belgium. Among his numerous writings are the following: *Mémoire sur le paupérisme des Flandres* (1850); *La question de la charité et des associations religieuses en Belgique* (1858).

DUCROCQ, dṳ'krŏk', Théophile Gabriel Auguste (1829—). A French jurist, born at Lille. He studied at the Collège Louis-le-Grand and the University of Paris, and was admitted to the bar of Poitiers in 1855. In 1863 he became titular professor of administrative law in the University of Poitiers, and in 1884 was called to a similar chair in the University of Paris. His *Cours de droit administratif* (1862), admirable in arrangement and lucid in style, is an authoritative work. He has also published *Le conseil d'état et son histoire* (1867), *Etudes de droit public* (1887), and *Etudes d'histoire financière et monétaire* (1887).

DUCROT, dụ'krō', AUGUSTE ALEXANDRE (1817-82). A French soldier. He was educated at Saint Cyr, and served in Algeria and in the Franco-German war. At Sedan, when MacMahon was wounded, he took the chief command, surrendering it immediately, however, to General Wimpffen. After the capitulation he was a prisoner of war, but escaped to Paris, where he took command of the Thirteenth and Fourteenth Army Corps, and participated in several sorties, among them the last disastrous one of January 19, 1871. After the conclusion of peace he was a member of the National Assembly, and in 1872 was appointed by Thiers commander-in-chief of the Eighth Army Corps, stationed at Bourges. His bitter attitude toward the Republic resulted in his being relieved of his command in 1878. He wrote: *La journée de Sedan* (1871); *La vérité sur l'Algérie* (1871); *Défense de Paris* (1785-78).

DUCROTAY DE BLAINVILLE, dụ'krō'tȧ' de blăN'vēl', HENRI MARIE (1778-1850). A French anatomist and zoölogist. He was born at Arques, near Dieppe, and studied at the University of Paris under Cuvier, whom he succeeded as professor of comparative anatomy in 1832. He was editor of the *Journal de Physique* from 1817 to 1825. He exerted an extraordinary influence over his pupils as a lecturer. In addition to the numerous valuable essays published in the *Annales françaises et étrangères d'anatomie et de physiologie*, in the *Journal* of the French Institute, and in similar scientific publications, he wrote the following important works: *Cours de physiologie générale et comparée* (1835); *Ostéographie* (26 serial numbers, with illustrations, 1839-54); *Manuel de malacologie et de conchyliologie* (1825-27).

DUCTILITY (from Lat. *ductilis*, ductile, from *ducere*, to lead). That property of some material bodies by which they are capable of being drawn out in length, while diminishing in breadth, without fracture or separation of their parts. Glass, gums, glues, resins, and some other bodies, when softened by water or heat, may be drawn into threads. The ductility of glass seems to have no limit; at high temperature this brittle substance may be drawn into threads finer than any hair, and of the highest flexibility. Metals are ductile, generally speaking, at any temperature, but their ductility varies greatly with the temperature; some—brass, for example—are more ductile at ordinary temperatures than when hot. The ductility of gold is very great: 500 feet of wire may be obtained from one single grain of gold. Next to gold follow, in the order of their ductility: silver, platinum, iron, copper, palladium, aluminum, zinc, tin, and lead. Platinum may be drawn out by making a bar of silver with a platinum core, drawing out the bar to extreme fineness, and dissolving off the silver with nitric acid. In this manner the wires adapted to microscopes for micrometric work are made. Such platinum wire is less than $\frac{1}{30000}$ of an inch in diameter. See MATTER, PROPERTIES OF.

DUDEN, dōō'den, KONRAD ALEXANDER FRIEDRICH (1829—). A German philologist. He was born near Wesel, and studied philology at Bonn. After organizing the gymnasium at Schleiz in 1869, and conducting that institution, he was appointed in 1876 director of the gymnasium at Hersfeld, an institution which was greatly improved under his management. His important writings on modern German orthography include *Vollständiges orthographisches Wörterbuch der deutschen Sprache* (3d ed. 1887); and a revision of Friedrich Bauer's *Grundzüge der neuhochdeutschen Grammatik* (5th ed. 1896; 21st ed. of original work).

"DUDES AND PHARISEES." See MUGWUMPS.

DUDEVANT, dụ'd'-väN', Madame. See SAND, GEORGE.

DUD'LAY, MLLE., stage name of ADELINE ELIE FRANÇOISE DULAIT (1859—). An actress of the Comédie Française, well known in tragic rôles. She was born in Brussels, and made her dramatic studies at the Conservatoire there. In 1876 she was engaged at the Théâtre Français, and made her début in Parodi's *Rome vaincue*. She made her reputation in many of the pieces in the classic répertoire, notably as Camille, in *Horace*, in *Phèdre*, in *Athalie*, as Monime, in *Mithridate*, and Berthe in *La fille de Roland*. She became a member of the company in 1883; in 1893, during its visit to London, she won new successes there. Among her more recent creations are La reine Juana (1893) and Frédégonde (1897).

DUDLEY. A town and Parliamentary borough in Worcestershire, England, 26 miles north-northeast of Worcester, and 8½ miles west-northwest of Birmingham (Map: England, D 4). It is a well-built town, and a chief seat of the iron trade, being in the heart of the so-called Black Country. Its noteworthy public buildings include the parish church, restored in 1862, the town hall, and the general hospital. Dudley sends one member to Parliament. The town's affairs are administered by a mayor, a municipal council of thirty, and a board of aldermen of ten members (see paragraph on *Local Government* under GREAT BRITAIN). It maintains public baths, but its gas and water supply are furnished by private companies. It is well supplied with educational institutions, which comprise a free grammar school, a technical school, an art school, and art gallery, and a public library, the last four being maintained by the municipality. Its chief manufactures are nails, fire-irons, chain cables, anvils, and vises. To the northeast of the town are the ruins of an old castle, founded in 760 by Dodo, a Saxon prince. It was demolished during the civil wars of the seventeenth century, was rebuilt, but was burned in 1750. Dudley was incorporated in 1865. In the vicinity are iron and coal mines, and limestone quarries. Population in 1891, 45,724; in 1901, 48,809.

DUDLEY, BENJAMIN WINSLOW (1785-1870). An American surgeon, born in Spottsylvania County, Va. After a prolonged course of professional studies, both in this country and abroad, he settled in Lexington, Ky. His specialty was lithotomy, or removing stone from the bladder, and he was known in England as 'the lithotomist of the nineteenth century.' He was professor of surgery in Transylvania University at Lexington, and was the author of many papers on medical subjects.

DUDLEY, CHARLES EDWARD (1780-1841). He was born in Staffordshire, England; removed to Albany, N. Y., became a prosperous merchant there, and was successively State Senator (1820-25), Mayor of Albany (1821-28), and United States Senator (1829-33). His devotion to astronomical science led his widow to give more than $175,000 for the erection and endowment of the Dudley Observatory at Albany.

DUDLEY, Edmund (c.1462-1510). An English lawyer and statesman. He studied at Oxford, read law at Gray's Inn, and early became a privy councilor to Henry VII. In 1497 he became Under-Sheriff of London, a post then of considerable importance to the Crown, as being useful in the collection of revenues from the great feudal chiefs. In this post he amazingly increased the King's wealth and his own. He became Speaker of the House of Commons in 1504. Upon the accession of Henry VIII., he was haled before a special commission, by which an indictment was found against him on the ground of an alleged treasonous attempt to obtain the throne. After a failure to escape from the Tower, he was beheaded on Tower Hill. He wrote a treatise in defense of absolute monarchy, entitled *The Tree of Commonwealth* (1859).

DUDLEY, Sir Henry Bate (1745-1824). An English journalist, born at Fenny Compton (Warwickshire). He was educated, it is said, at Queen's College, Oxford, took orders in the Anglican Church, became rector of North Fambridge, and subsequently curate of Hendon. In 1775 he was appointed editor of the *Morning Post,* and "contrived, before six weeks were over his head, to be called out for a criticism" (Peabody, *English Journalism,* 1882). With him the dueling-sword was not less mighty than the pen, for his reckless comments often involved him in personal encounters. He made the *Post* the most readable and widely circulated newspaper of the time, but he also embarrassed it with expensive actions for libel. Having been at last reluctantly dismissed, he established in 1780 the *Morning Herald,* a Liberal sheet, and at about the same time the *Courrier de l'Europe* (printed in French) and the *English Chronicle.* Through the *Herald* he defended the Prince of Wales—so adequately, in fact, that by 1813 he had been presented to several Irish benefices and the rectory of Willingham (Cambridgeshire), and had been made a baronet. He was a minor contributor to the satirical *Rolliad,* which first appeared in the *Herald,* wrote for the stage, and published *A Few Observations Respecting the Present State of the Poor* (3d ed. 1802), *A Short Address to the Lord Primate of all Ireland* (3d ed. 1808), and other works. This 'Fighting Parson' was also reckoned among the wits of the period.

DUDLEY, Lord Guildford (?-1554). See Grey, Lady Jane.

DUDLEY, John, Duke of Northumberland (c.1502-53). An English statesman. In 1542 he was made an admiral, and a peer with the title Viscount Lisle. From that time he displayed notable ability in naval, military, and civil offices. Created Earl of Warwick in 1546, and five years later Duke of Northumberland, he became after the execution of Somerset (1549) second to the King in influence. He schemed to have the succession brought within his own family: and when Edward VI. died Northumberland proclaimed his own daughter-in-law, Lady Jane Grey, queen. But, finding himself alone, he gave his support to Mary. Nevertheless, he was put to death for treason—at the last moment a penitent Roman Catholic. "Dudley was the ablest man of the time after the death of Henry VIII. He was a consummate soldier, a keen politician, and a skillful administrator. His nature was bold, sensitive, and magnanimous. . . . He was a great man, but his character was spoiled by avarice, dissimulation, and personal ambition." Consult: Tytler, *England Under the Reigns of Edward VI. and Mary* (London, 1839); Dixon, *History of the Church of England* (London, 1871-91).

DUDLEY, Joseph (1647-1720). A Colonial Governor of Massachusetts, the son of Gov. Thomas Dudley. He was born in Roxbury, Mass., and graduated at Harvard in 1665. He early became a member of the Massachusetts General Court, and was a magistrate of Roxbury in 1673. In 1682 he was sent to England with John Richards to endeavor to prevent the threatened repeal of the Massachusetts Charter, but, virtually taking the opposite side, he ingratiated himself with the Government, and in May, 1686, three years after his return, was appointed President of 'Massachusetts, Maine, New Hampshire, and the King's Province' (New York), having previously acted for several months as censor of the press. On the coming of Governor Andros (q.v.), early in 1687, Dudley became judge of the Superior Court, but, when Andros was overthrown by the popular party, in 1689, he was arrested on a charge of tyranny and usurpation, and was imprisoned for five months, at the end of which time he was sent to England, where, however, he was almost immediately released, the English Privy Council dismissing all charges against him. He then served as Chief Justice of New York from May, 1691, to September, 1692, presiding as such over the court which sentenced Leisler and Milbourne to death; returned to England in 1693 or 1694, and served for eight years as Lieutenant-Governor of the Isle of Wight. In 1702, after much intriguing on his part, he was appointed by Queen Anne Governor of Massachusetts and New Hampshire, which position he held in spite of frequent protests on the part of the people, until 1715. As Governor he stood for prerogative, and, though an able administrator, frequently antagonized the colonists by his arbitrary conduct, coming into almost annual conflict, in particular, with the Massachusetts General Court over the question of a stated salary for the Governor, instead of an annual grant. In the latter part of his administration—during Queen Anne's War—he was active in organizing and fitting out expeditions against the French and Indians. The historian Palfrey gives the following unfavorable estimate of Dudley's character: "Dudley united rich intellectual attributes with a groveling soul. To his mean nature, personal aggrandizement was the prime necessity. He had paid one price for it by dutiful behavior in his early years, and another by useful conduct in middle life, as often as such conduct would not thwart, and especially as often as it would further, the aims of his cupidity." For a somewhat detailed account of his administration as Governor of Massachusetts and New Hampshire, consult Palfrey, *History of New England,* vol. iv. (Boston, 1858-90).

DUDLEY, Paul (1675-1751). An American jurist, the son of Governor Joseph Dudley. He was born at Roxbury, Mass.; graduated at Harvard, and studied law in London. He was commissioned Attorney-General of Massachusetts in 1702, was promoted to the bench in 1718, was made Chief Justice in 1745, and for several years was a member of the Legislature. A learned naturalist, he was a fellow of the Royal Society of London and contributed papers on the natural history of New England to its *Transactions.*

DUDLEY, Robert. See Leicester, Earl of.

DUDLEY, Thomas (1576-1653). The second Colonial Governor of Massachusetts, born in Northampton, England. He acted for a time as a page to Lord William Compton, later Earl of Northampton; served as captain in the English Army during the French expedition of 1597; became a clerk to Judge Nichols about 1598, and from 1616 to 1630 was employed as the steward of Theophilus Clinton, the fourth Earl of Lincoln. In 1630 he emigrated to the Massachusetts Bay Colony, as Deputy Governor under Winthrop, and from this time until his death was, next to Winthrop, probably the most influential man in the Colony. He served thirteen years as Deputy Governor; was four times Governor of the Colony—in the years 1634, 1640, 1645, and 1650; was the chief founder of Newtown (now Cambridge), Mass.; took an active part in the founding of Harvard College, in 1636, and was twice elected President of the United Colonies of New England. He lived successively at Cambridge, Ipswich, and Roxbury, where he died. He was in many respects a typical Puritan, stern, unyielding, and intensely pious, and by many historians has been charged with being peculiarly narrow, bigoted, and intolerant — traits which many find in his dealings with Anne Hutchinson, Roger Williams, and Samuel Gorton. His latest biographer, however, strongly defends him on all these points. Dudley's daughter Anne (Bradstreet), the poet, married Gov. Simon Bradstreet (q.v.). Consult: The painstaking but somewhat partisan biography by Jones, *The Life and Work of Thomas Dudley, the Second Governor of Massachusetts* (Boston, 1899); and Deane (editor), *The Life of Mr. Thomas Dudley, several times Governor of the Colony of Massachusetts: written, as is supposed, by Cotton Mather* (Cambridge, 1870).

DUDLEY, Thomas Underwood (1837-1904). An American clergyman of the Protestant Episcopal Church. He was born in Richmond, Va., and in 1858 graduated at the University of Virginia, where for many years he was professor of Latin and Greek. During the Civil War he served in the Confederate Army, and rose to the rank of major in the commissary department. He afterwards studied theology in the Virginia Theological Seminary, was ordained priest in 1868, and in 1870 became rector of Christ's Church, Baltimore, of which during the previous year he had been assistant rector. He was Assistant Bishop of Kentucky for some time, was consecrated in Baltimore in 1875, and became Bishop in 1884.

DUDLEY, William Russel (1849—). An American botanist, born at Guilford, Conn. He graduated in 1874 at Cornell, and studied natural history at the school established by Louis Agassiz at Penikese Island, Idaho, in 1874, and at the Harvard Summer School in 1876. From 1876 to 1883 he was assistant professor of botany at Cornell, and from 1883 to 1892 an assistant professor directing the study of crytogamic botany. In 1892 he was appointed professor of botany in the Leland Stanford, Jr., University. His publications include contributions to scientific journals, *The Cayuga Flora* (1886), and other works.

DUDLEY DIAMOND, The. A heart-shaped jewel weighing 44½ carats, but originally twice that size, now in the possession of the Duke of Dudley, who bought it from Hunt and Roskell for £30,000. The latter paid only £12,000 for it. It was found in 1868 by the slave of Nie Kirk, a mine-owner in Africa.

DUDWEILER, do͞od'vī-lẽr. A town in Rhenish Prussia, 40 miles east by north of Metz (Map: Prussia, B 4). It has extensive coal-mines, and manufactures iron and clay wares. In the neighborhood is the celebrated 'Burning Mountain' (Brennender Berg), an elevation of coal deposits which has been burning for nearly two centuries. Population, in 1890, 8515; in 1900, 16,323; in 1905, 19,431.

DUE BILL. A written acknowledgment of indebtedness by the signer to the one to whom it is given. An example of its shortest form is this: 'I. O. U. eight guineas. John Leslie.' Another and more extended form is the following: 'Due Currier and Barker seventeen dollars; value received. Frederick Lockwood.' While from such an acknowledgment the common law infers an obligation by the signer to pay the specified indebtedness, the paper itself contains no actual or express promise to pay. It is the absence of such a promise that distinguishes it from a promissory note. Unlike a promissory note, also, it is not a negotiable instrument, though, as a claim or demand against the debtor, it is assignable by the payee. See Chose in Action; Negotiable Instrument.

DUELING (Fr. *duel*, from Lat. *duellum*, a contest between two, *duo*). A duel is a prearranged combat between two persons, in which deadly weapons are used. It generally takes place in the presence of witnesses (called seconds), who regulate the mode of fighting, place the weapons in the hands of the combatants, and enforce rules agreed upon. While dueling prevailed in antiquity, there is no doubt that the modern private duel grew out of the judicial duel. (See Battle, Trial by, or Wager of.) In France it became very common after the famous challenge of Francis I. to his rival Charles V., in 1528. After this every man of France seemed to think that he was called upon to use his sword in defending his honor against the slightest imputation. Some kings endeavored to suppress, while others promoted dueling. Within eighteen years, in the reign of Henry IV., it is said, no less than 4000 persons fell in duels. Rigid measures were passed, but were rarely enforced. Up to the present time duels are much more common in France than elsewhere, but fatal results are infrequent.

In Germany dueling prevails but little outside the army, navy, and the universities. In the students' contests the vital parts of the contestants are so protected that serious injury seldom occurs. In but few places do the laws permit duels, but in a number of university cities there is no pretense to enforce the laws. In every German regiment there is a court of honor, to determine all involved points of personal or regimental honor, and to decide upon the procedure demanded by the circumstances. Where the result is a duel, and the civil authorities do not take any cognizance of the affair, the military authorities themselves rarely act. It is a point of honor, however, with the individual officer to satisfy the regimental code, regardless of any punishment, civil or military, that may afterwards be meted out to him. The practice of dueling is common throughout all the armies of Continental Europe, although in most countries it is prohibited by law.

From the time of Queen Elizabeth various legislative attempts have been made in Great Britain to put an end to dueling, but without avail. Under the common law, the act of killing in a duel is regarded as murder, however fair the duel may have been; but so long as public opinion approved the duel it was generally found impossible to induce a jury to convict. In 1844 rigid army rules were established to prevent dueling, and within the last half-century but few duels have occurred in England.

How common dueling formerly was, both in Great Britain and America, may be inferred from the number of prominent political leaders who participated in duels. The dukes of York, Norfolk, Richmond, and Wellington, lords Shelburne, Talbot, Lauderdale, Townshend, Paget, Londonderry, Castlereagh, and Fox, Pitt, Sheridan, Canning, Hastings, Grattan, Curran, and O'Connell all fought duels. In the United States, Charles Lee and John Laurens, Cadwallader and Conway, General McIntosh and Gwinnett, of the Revolutionary period, and Burr and Hamilton, Jackson and Dickinson, Benton and Lucas, Clay and Randolph, De Witt Clinton and Swartout, and Cilley and Graves, fought duels. In no part of the world was dueling so earnestly engaged in as in America. Combats under all sorts of conditions, and with every conceivable variety of weapon, and in the great majority of instances fights fatal to one or both combatants were of frequent occurrence, and largely because of this was precipitated the legislation which finally succeeded in stamping out the custom.

Laws now exist in all States of the Union against dueling. In some cases the punishment is death, in others imprisonment, and in others disqualification to hold office. A bill prohibiting dueling in the District of Columbia was passed in 1839.

At the beginning of the twentieth century the custom was almost universally prohibited by law, although countenanced, if not actually demanded, by officers, both naval and military, professional men and the upper circles generally, of Continental European society. Organized efforts are now being made, however, to attack the custom in its own stronghold and among the people who still practice and cherish its traditions.

The International League, inaugurated in 1900 by Prince Alfonso of Bourbon and Austria-Este, has been organized with the declared intention of "setting right in the acceptation of society the sense of the words *cowardice* and *courage*, when used in connection with dueling." The French branch of the league is under the direction of M. Joseph du Bourg, and although its influence is as yet very limited, it has had the support of M. Paul de Cassagnac, formerly a well-known duelist, and was considerably aided by the refusal, in 1901, of Lieut.-Col. the Marquis d'Elbée to accept the challenge of the Marquis de Chauvelin. Early in 1902 the league succeeded in forming a tribunal of honor in Paris, which consists of fourteen members, six of whom are military or naval officers, and whose duties are to decide all disputed points without recourse to the duel. In the French provinces similar tribunals have also been organized, and have already justified their existence. The anti-duelist movement in Germany is under the active direction of the Prince of Löwenstein, and is very strong numerically and influentially. Its membership includes noblemen, soldiers, civilians, and university professors and students. The league publishes a representative periodical, and is championed by nearly every prominent newspaper in the Empire. In Italy, the Marquis Crispolti has been intrusted with the leadership of the movement, which, however, was not commenced until late in 1902. On February 14, 1902, the Spanish Republican Fusion Party, at Valencia, passed a resolution condemning the duel as contrary to civilization, and forbidding members of the party from taking any part in a duel, either as principal or second.

DUE PROCESS OF LAW. A phrase used in the Federal Constitution and in the constitutions of many of the United States as the legal equivalent of 'law of the land,' in Magna Charta (q.v.). Some of our State constitutions contain both phrases, while others employ the words 'due course of law,' or 'due course of the law of the land.' All of these forms of expression are ancient, and have long been understood to have the same meaning. They were used interchangeably in a series of statutes enacted under Edward III. (5 Edw. III., ch. 9; 25 id., ch. 4; 28 id., ch. 3), and were pronounced by Lord Coke to be legal equivalents. The Fifth Amendment of the United States Constitution declares that "No person shall be deprived of life, liberty, or property without due process of law," and the Fourteenth Amendment contains this clause: "Nor shall any State deprive any person of life, liberty, or property, without due process of law." By this phrase is meant law in its regular course of administration through the courts of justice; that is, law administered according to those rules and principles which have been established by our jurisprudence for the protection and enforcement of private rights; law which hears before it condemns, which proceeds upon due and orderly inquiry, and renders judgment only after trial.

This principle of constitutional law applies as well to the legislative and executive branches of government as to the judiciary. Neither Congress nor a State Legislature can lawfully deprive a person of life, liberty, or property by arbitrary enactment. A statute attempting to do that would not be a law of the land; it would be unconstitutional and void. The same would be true of a like provision in a State Constitution. To quote from a decision of the Supreme Court of Missouri: "It is as much out of the power of a State to deprive an owner of his property without due process of law through the medium of a constitutional convention as it would be thus to deprive him by an ordinary act of legislation."

But for the check of this principle upon the legislature and the executive, bills of attainder, acts of confiscation, acts reversing judgments, and acts directly transferring one man's property to another might be resorted to, and the time-honored safeguards of constitutional liberty be swept away.

It is not to be understood, however, that the 'law of the land' and 'due process of law' mean the body of legal rules or the system of judicial procedure which existed at the adoption of the Federal or of a particular State Constitution. These may be changed from time to time without violating the Constitution, provided the new procedure or the new rules are in accordance with the fundamental principles and maxims of our jurisprudence. Moreover, a State may do many things in the exercise of its police power which operate to deprive persons of liberty or property in a very summary way, without violating the constitutional provisions under consideration. It may also authorize the sale of property for nonpayment of taxes, without any judicial proceeding. But these acts are not performed without due process of law, since the State is acting in accordance with those principles governing and limiting the rights of the State and its subjects, not at variance with them. "In short, 'due process of law' in each particular case means such an exercise of the powers of government as the settled maxims of law permit and sanction, and under such safeguards for the protection of individual rights as those maxims prescribe for the class of cases to which the one in question belongs." See Cooley, *Constitutional Limitations* (6th ed., Boston, 1890); Hare, *American Constitutional Law,* Lect. xxxv. (Boston, 1889).

DUER, dū′ẽr, John (1782-1858). An American jurist, born in Albany, N. Y. From about 1820 until his death he practiced law in New York City. He was one of the commissioners to revise the laws of the State in 1825, was elected justice of the Superior Court in 1849, and in 1857 became Chief Justice. His most important work is *The Law and Practice of Marine Insurance* (1845-46).

DUER, William Alexander (1780-1858). An American jurist, born at Rhinebeck, N. Y. He practiced law at New Orleans, where he was the partner of Edward Livingston, and after 1812 in New York, where, from 1822 to 1829, he was judge of the Supreme Court. In the latter year he was elected president of Columbia College, which position he held until 1842. He published a *Treatise on the Constitutional Jurisprudence of the United States* (1833), and a *Life of William Alexander, Earl of Stirling,* his grandfather (1847).

DUERO (dwā′rō), or **DOURO** (dō′e-rō). A large river of Spain and Portugal, rising in the Spanish Province of Soria (Old Castile), in an elevated region about 25 miles northwest of the city of Soria (Map: Portugal, A 2). It flows at first southeast and south, past Soria, receiving the waters of the Rituerto, and then pursues a general westerly course till it reaches the Portuguese border. It then flows southwest, forming for about 60 miles the boundary between Spain and Portugal, after which it flows almost due west across Portugal, emptying into the Atlantic not far south of Oporto. Its total length is about 500 miles, over 160 miles of which is in Portugal. The Portuguese portion only is navigable, although its upper course might be utilized to some extent for transportation purposes, despite its swift, narrow current. Its mouth is closed by a bar and a number of sandbanks, which can be passed by ocean-going vessels only during high tide. The tributaries of the Duero are generally short, the greater number belonging to the Spanish portion. The most important are the Pisuerga, Valderaduey, Esla, Tua, and Tamega, on the right, and the Adaja, Tormes, and Agueda on the left.

DUET (It. *duetto,* from Lat. *duo,* two). A composition for two voices or instruments, with or without an accompaniment of one or more instruments. In technical language, *duet* is applied to a composition for two voices or instruments of the same kind, while *duo* refers to one for two voices or instruments of different kinds. Duets are divided into three classes, in all of which, however, the form is much the same. The *dramatic duet* can of necessity have no fixed form, as it must vary according to the dramatic situation. The *Stabat Mater* of Pergolesi is a splendid example of the *church duet,* while the *song duets* of Mendelssohn follow the general idea of duets as originated in the seventeenth century and developed in the eighteenth by Steffani and Clari.

DUEZ, dụ′ā′, Ernest Ange (1843-96). A French painter. He was born in Paris, and studied there under Pils. In 1873 his "Lune de Miel" ("The Honeymoon") attracted much attention. The following year "Splendeur et Misère" ("Splendor and Misery") won a medal of the third class. Among his other works are a fine portrait of Madame Duez (1877) and "Saint Cuthbert" (1879), in the Luxembourg. His style in his modern pictures is eminently Parisian, brilliant in tone and fine in drawing, although in some cases he carried realism to an extreme. He obtained a first-class medal in 1879, and the Legion of Honor in 1889.

DUFAU, dụ′fō′, Pierre Armand (1795-1877). A French political economist and publicist, born at Bordeaux. At the age of twenty he was appointed instructor at the Institute for the Blind, Paris. In 1840 he became director of the institution, and during the following fifteen years of his official activity published a great number of valuable works on the treatment and education of the blind. He was also one of the principal founders of the Aid Society for the Blind, established at Paris in 1851. His more important publications include: *Plan de l'organisation de l'institution des jeunes aveugles* (1833); *Statistique comparée des aveugles* (1854); and *De la réforme du mont-de-piété* (1855).

DUFAURE, du′fōr′, Jules Armand Stanislas (1798-1881). A French statesman, born in Saujon, Charente-Inférieure. He studied law in Paris, was chosen Deputy from Saintes in 1834, and acquired great influence in the Liberal Party. He was appointed Councilor of State in 1836 and Minister of Public Edifices in 1839. In 1844 he was chosen vice-president of the Chamber, and after the Revolution of 1848 was Minister of the Interior. Louis Napoleon gave him the same office, but after the coup d'état he returned to the practice of law.

He was made Minister of Justice in 1871, 1875, and 1877; but when Grévy became President, in 1879, Dufaure resigned permanently from the Ministry, though he continued to take part in the legislative work of the Senate.

DUFF, Alexander (1806-78). A Scotch missionary to India, born at Moulin, Perthshire. He was educated at the University of Saint Andrews, was ordained to the ministry of the Church of Scotland in 1829, and in the same year was sent as the first missionary of that Church to India. He established his headquarters at Calcutta, and decided to conduct his work on a new basis by founding a school which should later expand into a college, and in which the English language should be used for instruction, first in the Bible, and secondly in Western knowledge generally. His plan was to carry on evangelistic activity largely by means of educated native preachers. Upon the disruption of the Church of Scotland, in 1843, he adhered, with all other foreign missionaries of the denomination, to the Free Church. He was therefore obliged to surrender the mission, with its entire equipment, to the Establishment, to which it legally belonged. Soon, however, he developed a new institution larger and more efficient than the old, with branch schools in surrounding villages. In 1849 he was compelled by ill health again to visit Scotland, where he remained until 1856. In 1851 he was called to the chair of the General Assembly of the Free Church, and in 1854 traveled and spoke in the United States. He assisted in founding the University of Calcutta, and in 1864 permanently returned to Scotland. He was appointed the first professor of evangelistic theology at New College, Edinburgh, in 1867, and in 1873 was again elevated to the chair of the General Assembly. It was chiefly through his agency that the Livingstonia Free Church Mission, on Lake Nyassa, Africa, was organized. His publications include *The Church of Scotland's India Mission* (1835) and *The World-wide Crisis* (1873). Consult Smith, *The Life of Alexander Duff, D.D., LL.D.* (London, 1879).

DUFF, Mary Ann (1794-1857). A tragic actress, in her time the greatest upon the American stage. Her maiden name was Mary Ann Dyke, and she was born in London. She made her début in Dublin, in 1808, and there she became the wife of an Irish actor named John Duff, with whom she came to America in 1810. She first appeared in Boston as Juliet. Reputation came to her as Ophelia, Desdemona, Jane Shore, Lady Macbeth, and other tragic rôles. In 1821, in Boston, she played Hermione in *The Distrest Mother* so powerfully that Edmund Kean feared it might be forgotten that he was the "star." She first appeared in New York in 1823, as Hermione, to the Orestes of the elder Booth. In 1828 she played at Drury Lane, London, but soon returned to America. In 1835 she played for the last time in New York, and was married to Mr. Seaver, of New Orleans. There occurred her farewell to the stage, in 1838. Consult Ireland, *Mrs. Duff* (Boston, 1882).

DUFF, Monstuart Elphinstone Grant (1829-1906). An English politician and man of letters, born at Eden, Scotland. He studied at Oxford, was called to the bar in 1854 and from 1857 to 1881 sat in Parliament for the Elgin Burghs, rising to be Under Secretary of State for India (1868-74) and for the colonies (1880-81). From 1881 to 1886 he was governor of Madras, and on his return to England acted as president of the Royal Geographical Society (1889-93) and the Royal Historical Society (1892-99). His writings include a number of studies in foreign politics, memoirs of Henry Sumner Maine (1892) and of Renan (1893), and annual *Notes from a Diary* (1887-1901, 1904-5).

DUF'FERIN AND AVA, ä'vȧ, Frederick Temple Hamilton Blackwood, Marquis of (1826-1902). A British diplomat and statesman. The only son of the fourth Baron of Dufferin, he was born in Florence, Italy. He was educated at Eton and Oxford. He became fifth Baron of Dufferin, Clandeboye, Ireland, at the death of his father, in 1841, and was lord-in-waiting to the Queen for several years, under two administrations. He distinguished himself by literary production, and in 1855 was attached to the Austrian mission. In 1860 he was sent as British commissioner to Syria to inquire into the massacre of Christians. In 1864 he was appointed Under Secretary of State for India; in 1866, Under Secretary for War; and Gladstone, in 1868, made him Chancellor of the Duchy of Lancaster. From 1872 to 1878 he was Governor-General of the Dominion of Canada. He was Ambassador to Russia from 1879 to 1881. While Ambassador to Turkey (1881-84) he went to Egypt to restore order after Arabi Pasha's rebellion. His Viceroyalty of India (1884-88) was marked by the annexation of Burma, and an amicable delimitation of the Afghan frontier with Russia, after the Penjdeh affair. He was Ambassador to Italy from 1888 to 1891, and Ambassador to France from 1891 to 1896, when he retired from the diplomatic service. From 1891 to 1895 he was Lord Warden of the Cinque Ports. He received a number of titles, including an earldom in 1871 and the Marquisate of Dufferin and Ava in 1888. The degree of LL.D. was conferred upon him by several universities and colleges. Oxford University gave him the degree of D.C.L., and Punjab University, a doctorate of Oriental learning. In 1878 he was elected president of the Royal Geographical Society, and in 1891 lord rector of Glasgow University. Among his published writings are: *Narrative of a Journey from Oxford to Skibbereen during the Year of the Irish Famine* (1846-47); *Letters from High Latitudes*, descriptive of a yacht voyage to Iceland (1859); *Contributions to an Inquiry into the State of Ireland* (1866); *Irish Emigration and the Tenure of Land in Ireland* (1867); *Speeches and Addresses* (1882). His wife, Harriet Hamilton, is well known for her philanthropic work among the native women of India, and for the interesting books: *The Record of Three Years' Work* (1889); *Our Vice-Regal Life in India* (1890); and *My Canadian Journal* (1891). Consult Lyall, *Life of the Marquis of Dufferin and Ava* (London, 1905).

DUFF'IELD, George (1794-1868). A Presbyterian clergyman, born at Strasburg, Pa., a grandson of the Rev. George Duffield (1732-90). He was educated at the University of Pennsylvania and was ordained in 1815. He had charges successively in Carlisle, Pa., New York City, Philadelphia, and Detroit, and from 1840 to 1848 was regent of the University of Michigan. He was distinguished by a progressive spirit, and was prominently identified with the "new-school" movement. His publications include: *Regeneration* (1832); *Claims of Episcopal Bishops Examined* (1842); *Travels in the Holy Land; The Divine Organic Law, ...or Capital Punishment for Murder Authorized by God* (1848); and various addresses and discourses.

DUFFIELD, George (1818-88). An American Presbyterian clergyman, born at Carlisle, Pa. He graduated at Yale in 1837, and at Union Theological Seminary (1840). He held pastorates in Brooklyn, N. Y. (1840-47), Bloomfield, N. J., Philadelphia, Pa. (1852-61), Adrian, Mich. (1861-65), Saginaw, Mich. (1869-77), and Lansing, Mich. (1877-80). He became widely celebrated through his hymns, of which "Blest Saviour, Thee I Love" (1851) and "Stand Up, Stand Up for Jesus" (1858) are the best known.

DUFFIELD, John Thomas (1823-1901). An American clergyman and mathematician, born at McConnellsburg, Pa. He graduated at Princeton in 1841, and at the Theological Seminary in 1844, and in 1851 was ordained to the ministry of the Presbyterian Church. From 1847 to 1850 he was adjunct professor of mathematics at Princeton, in 1850 was appointed professor of mathematics, and from 1862 to 1871 was also professor of mechanics. He wrote *The Princeton Pulpit* (1850), and various monographs, including *The Philosophy of Mathematics* (1866).

DUFFIELD, Samuel Augustus Willoughby (1843-87). An American Presbyterian clergyman and hymnologist, son of George Duffield (q.v.). He was born in Brooklyn, N. Y., and was educated at Yale, where he graduated in 1863. After 1882 he preached in Bloomfield, N. J. His publications include *Warp and Woof* (1870); *English Hymns, Their Authors and History* (1886); and *Latin Hymn-Writers and Their Hymns* (1889), a posthumous publication, completed by Robert Ellis Thompson.

DUFFIELD, William Ward (1823—). An American soldier, born at Carlisle, Pa. He graduated in 1841 at Columbia, served in the Mexican War, and subsequently was connected as engineer with the construction of several railways. In 1861 he was appointed lieutenant-colonel of the Fourth Michigan Infantry, during the Civil War was twice wounded at Murfreesboro, and rose to be brigadier-general and brevet major-general. From 1878 to 1879 he was a member of the Michigan State Senate, later was active as a railway engineer, in 1892-93 was United States engineer on the White and Wabash rivers, and in 1894-98 was superintendent of the United States Coast and Geodetic Survey.

DUFFY, Sir Charles Gavan (1816-1903). An Irish patriot and author, born in the county of Monaghan, Ireland. In 1842 he founded, in company with Thomas Davis and John Dillon, the Dublin *Nation*, as the organ of the Young Ireland Party. In 1846 O'Connell quarreled with the Young Ireland Party, which thereupon reorganized under the name of the Irish Confederation. With other members of that body, Duffy was tried for treason-felony (1848), but was acquitted. He then revived the *Nation*, founded the Irish Tenant League, was elected to the House of Commons (1852), and established the Independent Irish Party; but, on account of the opposition of the ultra-Roman Catholics, resigned in 1856 and emigrated to Australia, where he took up the practice of law. He became Minister of Public Works in Victoria (1857), entered the Parliament there, and was Prime Minister in 1871. He was knighted in 1873. Returning to Europe in 1880, he took up his residence at Nice. He published *Ballad Poetry of Ireland* (1845), which has passed through fifty editions; *Young Ireland* (1880), and its sequel, *Four Years of Irish History* (1883), which together cover the period from 1840 to 1850; *Conversations with Carlyle* (1892); *Memoirs* (1898); and other works.

DUFOUR, dụ'fo͞or', Charles Valentin (1826—). A French archæologist, born in Paris. He was for some time in the library of the Hôtel de Ville, and contributed much to the best French magazines. His scholarly works have placed him among the foremost French archæologists. They include: *Les charniers des églises de Paris* (1866); *Recherches sur la danse macabre* (1873); *Le vieux Paris, ses derniers vestiges* (1878); and *Bibliographie artistique, historique et littéraire de Paris avant 1789* (1882).

DUFOUR, Guillaume Henri (1787-1875). A Swiss general, known also as a cartographer and military writer. He was born at Constance, Baden, and studied at the Polytechnic School of Paris, after which he received a commission in the French Engineers. After the fall of Napoleon he entered the Swiss service, and was rapidly promoted. In 1847 he commanded the Federal forces in the war against the Sonderbund, which he brought to a speedy termination. Among his published works are: *Permanent Fortifications* (1824); *A Manual of Military Tactics* (1842); and a treatise on the *Artillery of Ancient and Mediæval Times* (1840). His military map of Switzerland is a masterpiece of its kind.

DUFOUR, Jean Marie Léon (1780-1865). A French entomologist. He was born at Saint-Sever-sur-l'Adour, where he practiced medicine until his death. His investigations on the anatomy and metamorphoses of spiders, grasshoppers, scorpions, and other insects appeared in a series of more than two hundred articles which were published in the *Annales des sciences naturelles*, the *Annales de la Société entomologique de France*, and similar publications, during a period of fifty years (1811-61). One of his most important discoveries was that of the parasitic Gregarinidæ. Among his principal works may be mentioned *Recherches sur les hemiptères* (1833).

DUFRÉNOY, dụ'frā'nwä', Pierre Armand (1792-1857). A French geologist and mineralogist. He was born at Sevran, Seine-et-Oise, studied at the Ecole Polytechnique and the Ecole des Mines, was appointed a professor in the latter, and in 1848 became its director. In 1840 he was elected a member of the Academy of Sciences. His principal achievement as a scientist was the execution, in collaboration with Elie de Beaumont, of a geological map of France (1841), the publication of which, from the fact that it was the first prepared of an entire country, was an important event in the learned world. In connection with this work he spent thirteen years of exploration in France, England, and northern Spain. He also devised a new system of classification of minerals, based on crystallography. His writings include: *Voyage métallurgique en*

Angleterre (2d ed. 1837-39), with Elie de Beaumont; *Explication de la carte géologique de la France* (1841-48), also with Elie de Beaumont; and a *Traité complet de minéralogie*, with atlas (1844-45).

DUFRESNY, dụ'frȧ'né', Charles de la Rivière (1654-1724). A French writer of comedies, born in Paris. He became a valet de chambre to Louis XIV., and later inspector of the Royal Gardens, in which capacity he introduced many innovations from England. His comedies, *L'esprit de contradiction; Le mariage fait et rompu;* and *Le double veuvage*, still enjoy high rank for their brilliant repartee. His celebrated *Amusements sérieux et comiques* (1707; latest ed. 1869) became the prototype of Montesquieu's *Lettres persanes.*

DUGANNE, dû-găn', Augustine Joseph Hickey (1823-84). An American author, born in Boston. He early achieved some reputation as a poet by his *Hand Poems* (1844), a collection of verses previously published in newspapers. He was a founder of the American, or 'Know-Nothing,' Party, and served in the Civil War as colonel of the 176th New York Volunteers. Subsequently he was active as an author and journalist, and for many years was connected with the *New York Tribune.* A list of his works includes the following various titles: *The Iron Harp* (1847); *The Lydian Queen* (1848); *Poetical Works* (1856); *Utterances* (1864); and *Camps and Prisons* (1865).

DUG'DALE, Sir William (1605-86). An English antiquarian and historian, born in Warwickshire. His researches into the early history of Warwickshire and his adherence to the Royal cause led to his being knighted, and to his holding a number of offices in the College of Heraldry. His greatest work is the *Antiquities of Warwickshire* (1656; 2d ed. 1730), which has been the model for many county histories. Among his other works are: *Monasticon Anglicanum* (1755-73), written in part by Robert Dodsworth; *The Baronage of England* (1675-76); *Origines Juridicales, or Historical Memoirs of the English Laws* (1666); *Short View of the Late Troubles in England* (1681): and *The Ancient Usage in Bearing Arms* (1682). Dugdale bequeathed more than twenty-seven folio manuscript volumes, written in his own hand, to the University of Oxford. They are now in the Bodleian Library, the Heralds' College, and the Ashmolean Museum.

DUGÈS, dụ'zhȧ', Antoine Louis (1797-1838). A French naturalist, born at Landrecies, Nord. He was professor of pathology at Montpellier until his death. During the last two years of his life he was rector of the university. He was a skillful surgeon, and one of the foremost zoologists of the time. He investigated the anatomy of spiders, moths, frogs, and vertebrata. His publications include: *Manuel d'obstétrique* (3d ed. 1840); *Recherches sur les batrachiens* (1834); and *Physiologie comparée* (1838-39).

DUGONG' (Malay *dūyong*, Javanese *duyung*). A sirenian or 'sea-cow' (q.v.) of the family Halicoridæ and genus Halicore. It is distinguished by its well-developed dentition, and especially by the fact that in the males the incisors of the upper jaw are elongated almost into tusks; also by the fact that the tail is forked or crescent-shaped, and the swimming paws are destitute of any vestiges of nails. In general form, it much resembles the manatee (q.v.). The skull is remarkable for the sudden bending downward of the upper jaw almost at a right angle. The upper lip is large, thick, and fleshy, covering the prominent incisors, and forming a kind of snout, "something like the trunk of the elephant cut short across." The eyes are very small, and are furnished with a third eyelid or nictitating membrane. The skin is smooth and thick, and that of the Australian species yields a valuable oil, used sometimes in medicine, the demand for which has caused the animal to be almost exterminated in that region. The dugong is marine, inclined to gather near the shore in herds, which formerly sometimes numbered hundreds, and browses, with its head beneath the water, on the algæ which grow on submarine rocks in shallow seas. It is usually pursued in boats, and speared. The female produces one young one at a birth, and shows an affection for it which is proverbial among the Malays. When the young one is taken the mother is easily secured. Its habit of raising its round head out of the water, and of carrying the young under the fore fin, seems to have given rise, among the imaginative early voyagers in the Indian Ocean, to the legendary beings, half human and half fish, in allusion to which the name Sirenia was bestowed by Illiger on the order. (See Mermaid.) According to Rüppell, it was with the skin of the dugong of the Red Sea that the Jews were directed to veil the tabernacle, and not 'badger' skins, as translated in the Authorized Version of the Bible. Three species of dugong are known—one from the vicinity of Australia (*Halicore Australis*), one from the Red Sea (*Halicore tabernaculi*), and one from the East Indies (*Halicore dugong*). See Manatee and Extinct Animals; and for fossil forms allied to the dugongs, see Halitherium.

DUGOUR, Jardy. See Gouroff.

DUGUAY-TROUIN, dụ'gȧ' tro͞o'ăɴ', René (1673-1736). One of the most celebrated privateers and naval officers of France. He was born at Saint-Malo, of a family of rich shipowners, and, after some schooling at Caen, embarked in a frigate at the age of thirteen. At fifteen he was commander of a privateer, and began a marvelous series of exploits, capturing large fleets of transports and attacking and defeating ships of the line. The Channel, the coasts of Ireland and Holland, the fishing banks of Spitzbergen, and the Spanish Main were the scenes of his activity. As a reward for his services, Louis XIV. gave him the command of a frigate in the royal navy. Captured and taken to England, he escaped and continued his destructive activity. In 1707 he attacked an English merchant fleet and its convoy, sank one frigate, and captured three others. In 1709 he destroyed the Brazilian fleet off the port of Lisbon. In 1711 he captured Rio Janeiro after a bombardment of eleven days, and extorted a ransom of $300,000. For his services Louis XIV. knighted him and made him successively *chef d'escadre*, lieutenant-general, and naval commandant at Brest. Consult Richer, *Vie de Duguay Trouin* (Paris, 1789); also the biographies of La Landelle (Paris, 1876) and De Bona (Paris, 1890).

DU GUESCLIN, du gȧ'klăɴ', Bertrand (c.1320-80). A Constable of France, the most celebrated French soldier of his age. He was born at the Castle of Motte-Broons, near Dinans, Brittany, and entered the service of Charles of Blois in 1342. In 1354 he was knighted, and went with the lords of Brittany to England to secure the release of his captive master. He gallantly relieved Rennes, besieged by the Duke of Lancaster, in 1356, and by his help the city held out until the truce of Bordeaux, in June, 1357. He soon took service under the French King, and after several brilliant actions was made Marshal of Normandy and Count of Longueville in 1364. At the battle of Auray, in 1364, he was taken prisoner, but was ransomed, and becoming commander of the Grand Companies (see Condottiere), led them into Spain, where he aided Henry of Trastamare in his war against Pedro the Cruel. In 1367 he was taken prisoner by the Black Prince, then in alliance with Pedro the Cruel. Being again ransomed, he again fought for Henry, who received the kingdom in 1369. In 1370 he was made Constable of France, and for ten years was active and successful in driving the English from the south and west of the country. In 1373 he seized and held most of the strongholds in the Duchy of Brittany. He died while besieging the fortress of Châteauneuf-Randon. It is said that before his death the garrison had already promised to capitulate, and that their commander led them out and placed the keys of the castle upon the coffin of the Constable. Du Guesclin was ugly in appearance, brutal in his manners, and uneducated; but he had great natural abilities, and profited by his long experience. Consult: Froissart, *Chronicles;* Luce, *Histoire de Bertrand du Guesclin et de son époque* (Paris. 1876); Stoddard, *Bertrand du Guesclin, Constable of France* (London, 1897).

DUHAMEL, dṳ'ȧ'mĕl', Jean-Marie-Constant (1797-1872). A French mathematician, born at Saint-Malo. He occupied chairs in the Ecole Polytechnique, the Faculté des Sciences, and the Ecole Normale Supérieure. Besides numerous memoirs on mathematics, he published the following works: *Cours d'analyse* (Paris, 1840-41); *Eléments de calcul* (1856-57; 4th ed. by Bertrand, 1887); *Cours de mécanique* (1845-46); and *Des méthodes dans les sciences de raisonnement* (5 vols., 1866-72). "Duhamel exerted a great influence by the clearness and precision of his teaching. Possessed of a mind more exact than profound, devoting himself especially to perfecting the methods by which science progresses, he had the honor of being the first to give a rigorous demonstration of the principles upon which the infinitesimal calculus rests." (Paul Tannery.)

DUHAMEL, Joseph Thomas (1841—). A Canadian prelate. He was born in Contrecœur, studied at Saint Joseph's College, Ottawa; was ordained in 1863, and became Bishop of Ottawa in 1874 and Archbishop in 1886. Through his efforts the college at Ottawa obtained the powers of a Catholic university.

DUHAMEL DU MONCEAU, dṳ'ȧ'mĕl' dṳ môɴ'sō', Henri Louis (1700-81). A French botanist. He was born in Paris, and devoted himself to botany and arboriculture. He discovered that a disease of the saffron plant is caused by a parasitic fungus attacking the roots. In company with Buffon, and also independently, he experimented in vegetable and animal physiology. He was also interested in nautical matters, and during the latter part of his life was engaged as inspector-general of marine for the channel district of the French coast. On account of his researches in arboriculture he was elected a member of the Academy of Sciences of Paris. His most important publication is *Traité des arbres et arbustes, qui se cultivent en France en pleine terre* (2 vols., Paris, 1755; 2d ed., known as *Nouveau Duhamel*, ed. Etienne Michel and others, 7 vols., Paris, 1801-19). Other publications on arboriculture appearing between 1757 and 1783 were *Traité des arbres fruitiers* and *Pomona Gallica*.

DÜHRING, dṳ'rĭng, Eugen Karl (1833—). A German philosopher and political economist. He was born and educated in Berlin. After practicing law for three years he was compelled to abandon that profession in 1854 because of an affection of the eye, which eventually resulted in blindness. He was lecturer on philosophy and political economy at the University of Berlin from 1864 until 1877. His philosophical standpoint is often called materialistic, but the epithet does not do justice to his views. He believed in the competency of reason to comprehend reality. Actual reality as it appears in our experience is for him the only real existence and is thoroughly rational. He strenuously denies the Kantian doctrine that the categories (q.v.) of time and space have only subjective validity. In ethics he is an opponent of egoism and pessimism. His writings, however, are full of bitter personalities. In 1877 he was deprived of the privilege of lecturing at the University of Berlin because of his violent attacks upon his colleagues in his works. His economic works frequently show the influence of Henry C. Carey and other modern investigators. Among his most important publications are: *Natürliche Dialektik* (1865); *Der Wert des Lebens* (5th ed. 1894); *Kritische Geschichte der Philosophie* (4th ed. 1894); *Kritische Geschichte der allgemeinen Principien der Mechanik* (3d ed. 1887), considered one of the best works on that subject; *Kritische Geschichte der Nationalökonomie und des Sozialismus* (3d ed. 1879); *Die Judenfrage als Frage der Rassenschädlichkeit für Existenz, Sitten und Kultur der Völker* (4th ed. 1892); *Kursus der Philosophie* (1875); *Logik und Wissenschaftstheorie* (1878). Consult Döll, *Eugen Dühring: Etwas von dessen Character, Leistungen und reformatorischem Beruf* (1893).

DUHRING, d͞oo'rĭng, Louis Adolphus (1845—). An American dermatologist, born in Philadelphia, Pa. He graduated in the medical department of the University of Pennsylvania in 1867, and in 1867-68 was a resident physician of the Philadelphia Hospital. In 1868-70 he studied dermatology in European hospitals, and in the latter year established in Philadelphia a dispensary for cutaneous diseases. He was appointed clinical lecturer on dermatology at the University of Pennsylvania in 1871, and professor of diseases of the skin in 1876. His publications include an *Atlas of Skin Diseases* (1876), and a *Practical Treatise on Diseases of the Skin* (1878), the latter having been translated into Italian, Russian, and French.

DUIFFOPRUGGAR, dwê′fô-prụ′gär, Caspar (1514-72). One of the first known violin-makers in Europe. He was born at Freising in Bavaria, but nothing authentic is known of his early career, except that his original name was Tieffenbrucker; the change from that to the one by which he is best known having been caused by his residence in Italy and France, in which latter country he was finally naturalized (1559). He was long reputed to be the first maker of violins in Europe, but this claim has been seriously challenged by Dr. Coutagne in his *Gaspard Duiffoproucart et les luthiers lyonnais du XVII. siècle* (Paris, 1893). This authority claims that all the instruments known as Duiffopruggar violins were really the handiwork of Vuillaume, who is supposed to have got his ideas from a *viola de gamba* made by Duiffopruggar.

DUIKER, or **DUYKER**, dī′kẽr *or* doi′kẽr (Dutch, diver). (1) One of the small African antelopes or duikerboks of the genus Cephalolophus, often, but confusingly, called bushbucks by English residents and sportsmen; especially *Cephalolophus Grimmi*. They abound in forested and bushy districts, moving about in small parties, leaping among the rocks and dodging into and through the thickets with surprising agility, while their plain colors render them practically invisible when quiet. All have very convex foreheads, and very large eyes and ears, between which, in both sexes, rise two little spike horns, and a median tuft of stiff hairs. All these antelopes feed largely on berries and small fruits, and their flesh has an excellent flavor. The typical species known in the North as deloo is very common in southwest Africa. It is about 26 inches high, variable in color, and often tamed as a pet. The redbuck of Natal differs mainly in its reddish bay color. The Natal jungles also contain the diminutive bluebuck or pygmy antelope (*Cephalolophus monticola*), which is the smallest of the score or more of species in this genus, standing only 13 inches high; they "are smaller and lighter in build than a hare, and are of a bluish mouse-color." The hegoleh or madoqua (*Cephalolophus Abyssinicus*) of Abyssinia; the philantomba (*Cephalolophus Maxwelli*) of Sierra Leone; the wood antelope of the west coast (*Cephalolophus sylvicultor*); and the zebra antelope (*Cephalolophus doriæ*), also of West Africa, are notable species —the last-named of large size and golden-brown in color, striped with black bands across the back and loins. Consult: Schweinfurth, *Heart of Africa* (Leipzig, 1878), and other books of African exploration; also, Randall, *Proceedings Zoölogical Society of London* (London, 1895). See Colored Plate of Antelopes. (2) In South Africa, a diving bird, as a cormorant or the darter (*Plotus Levaillanti*), the latter illustrated in the Plate of Fishing Birds.

DUILIAN COL′UMN. A column erected in the Forum at Rome in honor of the naval victory of C. Duilius (q.v.) over the Carthaginians. The name *columna rostrata*, 'rostrate column,' the class to which this belongs, was given to columns commemorating naval victories (from *rostrum*, the beak of a ship), as they had on each side projections in the form of such beaks, which were usually the actual beaks of the captured vessels of the enemy. Michelangelo restored this column, and his restoration is in the Palazzo de' Conservatori, on the Capitoline Hill. Its pedestal retains a portion of an inscription, which is what remains of an inscription upon a restored column erected in Imperial times, to take the place of the original, which was destroyed by lightning.

DUILIUS, dû-ĭl′ĭ-ŭs, Gaius. Roman consul in B.C. 260, and victor of the great naval battle against the Carthaginians off the promontory of Mylæ, Sicily. In the spring of B.C. 260 the Romans launched the 120 sail composing their first fleet. Duilius's colleague, Gnæus Cornelius Scipio, was appointed commander, and sailed for Messana with the first seventeen vessels prepared. Having attempted to capture Lipara, he was blockaded by the Carthaginians in the harbor of that island, and was captured with his entire squadron. Duilius thus succeeded to the command, and with the main Roman fleet met the enemy advancing from Panormus. A battle ensued off the promontory of Mylæ, northwest of Messana. The inferiority of the Roman vessels and crews was counterbalanced by the use of a boarding-bridge which Duilius had invented. The design was to run closely alongside the enemy, to drop the bridge, and thereby to grapple the ships together. The conditions were thus to approximate those of a conflict on land. The bridge proved entirely effective. Of the Carthaginian fleet Duilius sank or captured fifty galleys, including the commander's seven-banked flagship, taken from Pyrrhus. The immediate effect of this victory was, of course, to turn the tide of the war, but its ultimate result was far greater. Rome became forthwith a naval power, able to dispute with Carthage the supremacy of the Mediterranean. Duilius celebrated the first naval triumph in Roman history. He was honored by the erection of two memorial columns, and, so Cicero tells us, was throughout his life permitted on his return from banquets to be attended by torch-bearers and a piper.

DUISBURG, dōō′is-bụrk. A town of Rhenish Prussia, situated about 15 miles north of Düsseldorf, between the Ruhr and the Rhine, with both of which it is connected by a canal (Map: Prussia, B 3). Among its numerous churches that of Saint Salvator, a handsome Gothic edifice of the fourteenth century, containing some interesting mural decorations and the tomb of the famous geographer Mercator, deserves special mention. The streets are well laid out, and a modern system of sewers has been introduced. From its water-supply the city nets an annual profit of about $55,000. It also owns the gas-works. Its manufactures are numerous and important. It has iron-foundries, blast-furnaces, machine-works, steel and brass works, important chemical-works and factories manufacturing malt liquors, asphalt, glue, varnish, furniture, tobacco, soda, sulphuric acid, soap, starch, and sugar. Duisburg is one of the principal points of export for the Westphalian coal trade, and has two large harbors. In addition to the products manufactured in the city, the exports include those of the surrounding country, viz. iron ore, coal, and grain. The total tonnage entering and leaving in 1901 amounted to nearly 6,500,000. It has ample railway facilities and an electric railway line for interurban traffic. Population, in 1890, 59,285; in 1900, 92,729; in 1905, 192,346. Duisburg is an ancient town. It was in all probability the Castrum Deutonis of the Romans and the Dispargum of the Franks. It was strongly fortified by Charlemagne. In the Thirteenth Century it was a member of the Hanseatic League, and afterwards a free town of the Empire, and later a part of the territory of Cleves, but at the close of the Napoleonic wars it was handed over to Prussia.

DUJARDIN, dụ'zhär'dăɴ', Felix (1801-60). A French zoölogist, born at Tours, France, April 5, 1801. He studied at Tours and in Paris, and was later professor of zoölogy in the Faculté de Rennes. He wrote many works on worms, insects, etc., including *Histoire naturelle des infusoires* (1841); *Histoire naturelle des helminthes* (1844). He died at Rennes, April 8, 1860.

DUJARDIN, Karel (1622-78). A Dutch painter, born probably in Amsterdam. He was a pupil of Nikolaas Berchem, and was influenced by Potter, but went to Italy while still young, and did not return to Holland for several years. His pictures have more of the Italian than the Dutch atmosphere. They usually represent landscape, with figures and animals painted with great freshness and animation. The treatment of the animals has been compared favorably with that of Paul Potter. Dujardin's pictures are somewhat scarce, as he worked slowly. The best of them are in the Louvre in Paris, and one of these, "The Charlatans" (1657), is his masterpiece, although "Christ on Calvary" is as notable a work in another genre, and so is his own portrait. He also left some etchings of animals and landscapes.

DUKATO, Cape. See Cape Dukato.

DUK-DUK. A secret society among the Melanesian natives of New Britain. Its objects are, or have been from time to time, to keep up the esoteric practices of the tribe, to strengthen the power of chiefs and their favorites, to keep the women under and levy blackmail upon them, to police the primitive village and preserve order and respect among the youth, to deal out rude justice, etc. They are composed entirely of men, and the initiation fees for members are sometimes very large. Their masked dances and other ceremonials give scope for native ingenuity. The Duk-Duk is of great sociological importance, combining or including as it does many of the features of the bachelors' club, *Vehmgericht*, charivari, lodge, etc., of civilized peoples. The Duk-Duk has analogues elsewhere in Oceania, and also, to some extent, in the 'Mumbo Jumbo' societies of the West African negroes. Consult: Powell, *Three Years Among the Cannibals of New Britain* (London, 1884); and an interesting article by Graf von Pfeil in the *Journal of the Anthropological Institute* (London, 1897).

DUKE (Fr. *duc*, It. *duca*, Sp., Port. *duque*, MGk. δούξ, *doux*, from Lat. *dux*, from *ducere*, to lead). A title given among the Romans to a general commanding a single military expedition, and holding no other power than that which he exercised over his soldiers. The designation first arose in the early part of the second century, and entered into the official hierarchy of Rome very soon after. Upon the separation of the civil and military functions in the fourth century the duke became commander of all the troops cantoned in a single province. In an Imperial almanac edited about the year 400, twenty-five dukes are mentioned in the whole extent of the Empire, thirteen in the east and twelve in the west. The prerogatives of the dukes at this time were extensive. At first they were judges in all military trials within their jurisdiction, but, in Italy at least, they ended by centralizing in their own hands all the civil and military powers. The Byzantine duke was chief of the provincial soldiers, named the civil and military officers of the lower grade, and heard appeals from their judgments. He held the civil and criminal jurisdiction and even sat with the bishop to hear ecclesiastical cases. He protected the Church and had important functions in its administration. Finally, he took a part in managing the financial affairs of the province. See Exarch.

In France, under the Merovingian rule, the dukes were the highest officers in the provincial administration. At first they were only military chiefs, but about the seventh century they gained the same military and judicial powers as the counts (q.v.). The latter, however, governed but a single city, while the duke's administration extended over several cities, each with its count. When the King appointed a duke, it was for the purpose of preventing or repressing a revolt of the counts, or for the defense of the frontier. There was a ducal tribunal, but it was not superior to that of the count. Apparently the tribunal was held in special cases, by the order of the King. The possibility of conflicting powers caused frequent strife between the dukes and counts. The Carolingian dukes did not differ greatly from the Merovingian; but as the central power grew weaker in this period, the power of the dukes increased. The dukes acquired regal rights, and by the end of the tenth century had made their tenure hereditary. They had acquired independence and were no longer held to the central power except by the weak bond of homage. In general, the duke assumed all the rights which the King could not retain for himself. Toward the close of the twelfth century royalty strove to regain the rights of which it had been robbed. The dukes, however, retained their powers longer than the lesser dignitaries. Some duchies were reunited to the crown, but new ones were created, so that the number increased as their size decreased. Gradually, however, the powerful ducal sovereignties were extinguished, and by the early part of the sixteenth century the King had no rival to fear. The duchies granted after the thirteenth century, as a general thing, enjoyed none of the ancient privileges of independent sovereignty. The dukes were only the first subjects of the realm. Titles of nobility in France were abolished by the Constituent Assembly during the Revolution, but were restored by Napoleon, and the ducal title was conferred on his marshals. Several ducal peers were created by Louis XVIII. and Charles X. In Germany the dukedom passed through phases similar to those which it had exhibited in the earlier history of France. What is peculiar to the position of the nobility of Germany will be found under Graf.

Dukes, in the older European sense, do not appear ever to have existed in England. The title seems not to have been known earlier than the reign of Edward III.; and from the first it was a mere honorary distinction. The Black

Prince, who was created Duke of Cornwall in 1337, was the first English duke. In 1351 Henry, the King's cousin, was created Duke of Lancaster, and when upon his death his daughter was married to John of Gaunt, the King's fourth son, the title was transferred to him, his elder brother Lionel being made Duke of Clarence. In the succeeding reign—that of Richard II.—the two younger sons of Edward III. were created, the one Duke of York, and the other Duke of Gloucester. The dignity was thus, in the first instance, confined to the royal house. But the families of Holland and Mowbray very soon received the same title, and one of the Beauforts, an illegitimate son of John of Gaunt, was raised to the peerage with the title of Duke of Exeter. In the reign of Henry VI. the title was granted more widely, and there were at one time ten duchesses in his Court. The Staffords, Beauchamps, and de la Poles belonged to this period. King Henry VIII. created only two dukes—one, his illegitimate son, whom he made Duke of Richmond; and the other, Charles Brandon, who married his sister Mary, and was made Duke of Suffolk. Queen Elizabeth found only one duke when she came to the throne—Thomas Howard, Duke of Norfolk—attainder or failure of male issue having extinguished the rest of them. After the attainder and execution of the Duke of Norfolk, there was no duke in England, except the King's sons, till Ludovic Stuart, a relative of the King, was made Duke of Richmond in 1623. In 1623, also, Villiers was made Duke of Buckingham. On the Restoration, Charles II. raised the Seymours to the rank of Dukes of Somerset, and created Monk Duke of Albemarle. But the custom of conferring this dignity on the illegitimate sons of the monarch was still adhered to, as in the case of the Duke of Monmouth, who was the illegitimate son of Charles II., and the Duke of Berwick, son of James II. Of the existing dukes, besides the descendants of Charles II., there are only three families whose titles date from before the Revolution of 1688, the Dukes of Norfolk, Somerset, and Beaufort. William and Anne, by advancing a very considerable number of the first families of peers to the rank of duke, altogether changed the character of that dignity. In 1901 there were twenty-nine dukes in the United Kingdom, excluding dukes of the royal blood. The ducal coronet, as now worn, has eight golden leaves of a conventional type, set erect upon a circlet of gold. The stalks of the leaves are so connected as to form them into a wreath.

DUKE HUMPHREY'S WALK. The middle aisle of old Saint Paul's, London, where the tomb of Duke Humphrey (q.v.) is said to be. The old saying of 'dining with Duke Humphrey,' was in allusion to persons who walked there during dinner time.

DUKE OF EXETER'S DAUGHTER. A nickname applied in the fifteenth century to an instrument of torture resembling a rack. Blackstone says (*Commentaries*, ii., sec. 326): "The trial by rack is utterly unknown to the law of England, though once when the Dukes of Exeter and Suffolk, and other ministers of Henry VI., had laid a design to introduce the civil (i.e. Roman) law into the kingdom as the rule of government, for a beginning thereof they erected a rack for torture, which was called in derision the Duke of Exeter's daughter, and still remains in the Tower of London, where it was used as an engine of State, not of law, more than once in the reign of Queen Elizabeth. But when upon the assassination of Villiers, Duke of Buckingham, by Felton, it was proposed in the Privy Council to put the assassin to the rack, in order to discover his accomplices, the judges, being consulted, declared unanimously that no such proceeding was allowable by the laws of England."

DUKE OF GUISE, The. A tragedy, of political significance, by Dryden and Lee, published in 1682, and directed against the violent Whiggism of Shaftesbury and Monmouth. So great was the feeling aroused by the piece that Dryden afterwards issued an apologetic pamphlet entitled *A Vindication of the Duke of Guise.*

DUKE OF YORK'S SCHOOL, or ROYAL MILITARY ASYLUM. A school founded at Chelsea, by Frederick, Duke of York, in 1801-03, for the support and education of soldiers' orphans. Originally, girls as well as boys were admitted, but the admission of girls was discontinued after some years' trial. The institution is supported by Parliamentary grant, and is under the control of a board of commissioners. Boys, leaving school, in many cases enter the army, or are apprenticed to trades. There are some 500 boys in the school.

DUKHOBORTSY, dụ′kô-bôrt′sĭ, or DUKHOBORS (Russ., spirit-wrestlers, from *dukhŭ*, spirit + *borotĭ*, to overcome, to fight; so called from the denial by the sect of the divinity of the Holy Ghost). A Russian religious sect, founded in Kharkov, about 1740-50. It increased in numbers under Kolesnikoff in the Government of Ekaterinoslav (1750-75), and under Kapustin in Tambov (1755-85). This rapid growth caused governmental persecutions in 1793-94 and 1797-1800, but Commissioner Lopukhin's favorable report (1801) moved the Government, on his recommendation, to settle the Dukhobortsy on the bank of the river Molochnaya in Taurida. A large tract of fertile land and a comparative immunity from official annoyances brought a period of thrift and prosperity. About 1819 the Government resumed hostile measures, which culminated in their deportation to Transcaucasia (1837). Pobiedonostseff's policy of bringing all religious elements of the empire into conformity with Greek Catholicism was responsible for the severities which attracted the world's attention to the sect in the nineties. After long petitioning many thousands were allowed to leave for Cyprus and Canada. Their religious views are simple and handed down by oral tradition. Christ was only a man of superior godlike intellect, and his soul has migrated into many mortals, Kolesnikoff and Kapustin among others. All people are equal, and, being children of God, do what is right; hence there is no need of rulers. They do not visit the churches, considering that wherever two or three persons endowed with intellect, even if Jews or Mohammedans, gather for worship, there is a church. They accept the Ten Commandments, and of the Bible 'only the useful' portions, interpreting the rest allegorically. They have no icons, confession, or ceremonies at marriages, which they contract by the heart's inclination only. In private life, wives and husbands are sisters and brothers; the parents are addressed: 'old man,' 'old woman.' The plenary power of a Dukhobor community is vested in the assembly of elders. As members of society they are generally conceded to be quiet, sober, and hard-working. They belong exclusively to the peasant class. In the fall of 1902 the sect in Canada suffered great hardships. They felt inspired to seek the Christ, and set out across the bleak stretches of Manitoba, regardless of all personal discomfort. Intense was the cold, and many fell by the way. At length, urged by a spirit of humanity, the Government interfered, and insisted on their turning back to their homes.

DU'KINFIELD. A municipal borough of Cheshire, England, on the Tame, five miles east of Manchester (Map: England, E 3). It has large cotton-factories, iron-foundries, fire-brick and tile works, and collieries. The town was incorporated in 1899. It owns its gas-works, and with the neighboring town of Ashton-under-Lyne, owns its water-supply and maintains a cemetery. It has established a fire department and acquired a technical school and free library. Population, in 1891, 17,385; in 1901, 18,929.

DULAG, dōō-läg'. A town of Leyte, Philippines, situated on the eastern coast of the island, 22 miles from Tacloban. Population, in 1903, 14,884.

DULANGAN, dōō-län'gȧn, or GULANGANE. A wild Malayan people, pure and mixed, in Dávao Province, Mindanao. See PHILIPPINES.

DULA'NY, DANIEL (1686-1753). A colonial lawyer of Maryland. He was born in Ireland, emigrated to Maryland about 1700, was admitted to the Maryland bar in 1710, became a member of the Council of State, and was for some years commissary-general of the province. He wrote a vigorous pamphlet entitled *The Right of the Inhabitants of Maryland to the Benefit of English Laws.*

DULANY, DANIEL (1721-1797). The foremost lawyer in Maryland during the colonial period, son of the preceding. He was born in Annapolis; was educated at Eton College, Cambridge University, and the Temple, England; was admitted to the bar of Maryland in 1747, and soon gained the reputation both in England and in America of being one of the greatest lawyers of his time. He was deputy commissary and commissary-general from 1754 to 1761, was a member of the Provincial Council from 1757 to 1775, and was deputy secretary and secretary of Maryland from 1761 to 1773. In 1765 he wrote a powerful pamphlet against the Stamp Act, entitled *Considerations on the Propriety of Imposing Taxes on the British Colonies, for the Purpose of Raising a Revenue by Act of Parliament.* Though published anonymously, it was immediately recognized as his, and was later published under his name. The best argument against arbitrary taxation hitherto written, it attracted widespread attention, had a tremendous influence both in America and in England, and formed the basis of Pitt's great speech in 1766 against the Stamp Act. Dulany consistently opposed the radical measures of the Patriot party, refused to take any part in the Revolution, and in consequence lost, by confiscation, nearly the whole of his vast estates. Consult an article by J. H. B. Latrobe, in *The Pennsylvania Magazine of History and Biography*, vol. iii. (Philadelphia, 1879); and Tyler, *Literary History of the American Revolution* (New York, 1897).

DULAURE, dụ'lôr', JACQUES ANTOINE (1755-1835). A French publicist and historian, born at Clermond-Ferrand. He studied in Paris, and afterwards became engaged in several engineering projects, one of which involved the construction of a canal between Bordeaux and Bayonne. He was editor of the *Evangélistes du Jour* and developed an extraordinary journalistic activity during the Revolution. In 1792 he was elected a member of the National Convention, and became identified with the Girondists until the downfall of that party. As one of the Council of Five Hundred he devoted himself chiefly to the improvement of the educational system, and afterwards became one of the bitterest opponents of Napoleon, until the appointment of the latter to the consulate, when he retired from politics. He was not only a distinguished legislator, but an inventor of considerable ability, as attested by the ingenious instrument known as the 'pantograph,' which he devised. His publications include: *Description des principaux lieux de France* (6 vols., 1788-90); *Histoire civile, physique et morale de Paris* (7 vols., 1821, frequently reprinted; continued by Leynadier, 5 vols., 1862, and by Rouquette, 1875 et seq.); *Esquisses historiques des principaux événements de la révolution française* (6 vols., 1823-25; frequently reprinted), a history of the French Revolution to the restoration of the Bourbon dynasty; and *Histoire de la révolution française depuis 1814-30* (in collaboration with Vierne and others; 8 vols., 1834-41; frequently reprinted).

DUL'CAMA'RA. See BITTERSWEET.

DUL'CE DO'MUM. A school song of Winchester School, England, said to have been composed by a boy detained at the school during the Whitsuntide holidays. It dates from the eighteenth century. It is sung by the students in procession on the evening before the holidays.

DULCE Y GARAY, dōōl'thȧ ē gȧ-rī', DOMINGO, Marquis of Castell-Florit (1808-69). A Spanish soldier and governor-general, born at Sotés, Province of Logroño. He participated in the first Carlist War, and while Captain-General of Catalonia helped to promote the Revolution of 1854. In 1862-66 he was Captain-General of Cuba, in which post he furthered all reforms, particularly such as led to the suppression of the slave traffic. He was reappointed in 1869, but soon after resigned.

DULCIGNO, dōōl-chē'nyô. A fortified seaport of Montenegro, on the shore of the Adriatic, 15 miles south-southwest of Scutari (Map: Balkan Peninsula, B 4). The harbor is difficult of access, but deep enough for heavy vessels. The inhabitants, numbering 5005 in 1896, are engaged chiefly in oil trade and seafaring. Dulcigno belonged, until A.D. 1180, to the Byzantine Empire, and subsequently to the Serbs and Venetians, passing to Turkey in 1571. It was taken by the Montenegrins in 1878, but did not come permanently into their possession until 1880.

DUL'CIMER (OF. *doulcemer*, from Sp. *dulcémele*, It. *dolcemele*, dulcimer, from Lat. *dolce melos*, sweet song, from *dulcis*, sweet, and Gk. *μέλος*, *melos*, song). A very ancient musical instrument which has varied greatly in its form.

In modern times its construction has resembled a flat box, with sounding-board and bridges, strung with thin wire, and played on by striking the wires with mallets which have one soft and one hard face. Its compass is from g to g^3. In England its tuning has been always diatonic, but in Germany toward 1800 it became chromatic. The dulcimer was the prototype of the pianoforte just as the psaltery was of the harpsichord, the sole difference between them being that the dulcimer was played with hammers and the psaltery with a plectrum. It was formerly supposed that the dulcimer was of German origin, but it is more likely that it came from the East through the Crusades; for it was known in Persia and Arabia for centuries under the name of *santir*. By 1550 it was known in Europe under its present name, but little importance was attached to it. The pantaleon (q.v.) was an enlarged form of a dulcimer. See Pianoforte.

DULCIMER IN CASE.

DULCINE′A DEL TOBO′SO, *Span. pron.* do͞ol′thē-nä′ȧ dĕl tô-bō′sô. The romantic title given by Don Quixote to the peasant's daughter Aldoriza Lorenzo, who was born at Toboso, and whom he selects as his lady, and whose champion he becomes. The name Dulcinea is a popular term for a lady love.

DUL′CINISTS. The followers of Dolcino. See Apostolic Brethren.

DULK, do͞olk, Albert Frederick Benno (1819-84). A German author. He was born in Königsberg and studied medicine and the natural sciences in that city and in Leipzig and Breslau. He took an active part in the popular uprising of 1848, at which time his revolutionary drama *Lea* appeared. After traveling in the Orient, he settled in Geneva in 1850, and subsequently in Stuttgart, where he wrote the dramas *Jesus der Christ* (1865) and *Simson* (1859), in which play the conflict between Judaism and paganism is depicted. One of his later dramas, *König Enzio*, was set to music by Abert. As an adherent of socialism he became conspicuous, in 1871, through his opposition to the war with France, and his publications *Patriotismus* and *Frömmigkeit* obtained a wide circulation. In 1882 he founded in Stuttgart the first society of freethinkers in Germany, and during the last years of his life devoted his pen principally to the discussion of the radical side of religio-philosophical subjects.

DÜLKEN, dṳl′ken. A town in the Rhine Province, Prussia, Germany, 20 miles west of Düsseldorf. It is a thriving industrial town, with iron-foundries and manufactures of machinery, silk, velvet, cotton, and linen. Population, in 1900, 9517; in 1905, 10,033.

DULLER, do͞ol′lẽr, Eduard (1809-53). A German historian. He was born and educated in Vienna. Notwithstanding the success of his drama, *Meister Pilgram*, which was publicly performed before the author was nineteen, he left Austria and went to Germany in 1830, residing successively in Munich, Frankfort, Darmstadt, and Mainz, where he was appointed preacher in the German Catholic Church (1851). He took a prominent part in the German Catholic movement, and was a strenuous defender of religious liberty. Besides several meritorious lyrical and dramatic productions, he published the following standard historical works: *Vaterländische Geschichte* (1852-57; subsequently concluded by Hagen); *Geschichte des deutschen Volks* (7th ed. 1891); *Geschichte der Jesuiten* (1845; latest ed. 1893).

DULONG, dṳ′lôɴ′. Pierre Louis (1785-1838). A French physicist and chemist, known chiefly for the law which he discovered, jointly with Petit, in 1819. According to the law of Dulong and Petit, the specific heat of an element, multiplied by its atomic weight, is the same for all solid elements. The law was established empirically, and no theoretical explanation of it has yet been found. Dulong received his education at the Ecole Polytechnique, where he became, in 1820, professor of physics. In 1823 he was admitted into the Academy of Sciences. While investigating the composition of the chloride of nitrogen, he lost an eye through the explosion of a quantity of this substance.

DULONG AND PETIT, pe-tē′, Law of. See Atomic Weights.

DULSE (Gael. *duileasg*, dulse, from *duille*, leaf + *uisge*, water), *Rhodymenia palmata*. An edible seaweed, one of the Ceramiaceæ, which grows on rocky marine coasts. It is used as an article of food by poor people on the coasts of the British Isles, and other northern countries, and occasionally also as a luxury by some of the wealthier classes who have acquired a taste for it. It has a purple, leathery or somewhat membranous, veinless, sessile leaf, irregularly cut, with repeatedly forked segments, which are either entire at the edges, or furnished with lateral leaflets. The spores are distributed in cloud-like spots over the whole leaf. The name dulse is also given in the southwest of England to another seaweed, Iridæa edulis, also one of the Ceramiaceæ, which has an undivided, obovate or wedge-shaped, expanded, very succulent leaf, of a dull purple color. It is occasionally employed as food both in the southwest of England and in Scotland. Laurentia pinnatifida, another of the Ceramiaceæ, has a compressed cartilaginous twice or thrice pinnatifid leaf. It has a pungent taste, and is used as a condiment when other seaweeds are eaten. In Alaska the name dulse is given to the seaweed Porphyra laciniata. It is gathered, pressed into cakes, and dried. When desired for use it is broken or shaved into hot water and cooked for half an hour, when a nourishing porridge is obtained. Similar uses of this and related plants are reported from Japan, China, and elsewhere along the Pacific coasts.

DULUTH, dû-lo͞oth′. A city and lake port, the county-seat of Saint Louis County, Minn., at the western end of Lake Superior, 152 miles north-northeast of Saint Paul and 13 miles north of Superior, Wis. (Map: Minnesota, F 4). The city is especially favored with facilities for transportation by rail and water. It is the terminus of the Northern Pacific, the Chicago and Northwestern, the Great Northern, and of several other railroads, and of thirteen steamship lines. Duluth has a natural harbor, nine miles long and two miles wide, entrance to which is made by two canals, the principal one being at Duluth, the other seven miles south, both piercing the narrow strip of land called Minnesota Point, which separates the lake from the harbor. The city's trade by water is greatly facilitated by the Sault Sainte Marie Canal (the traffic of which greatly exceeds that of the Suez Canal), and is considerably increased by the fact that this is the nearest shipping town on the lakes for the Northwest. Duluth now ranks among the leading shipping points in the United States. Of its exports, lumber, flour, iron ore, and grain are the most important. It has a large blast-furnace, iron-works, machine-shops, match-factories, sawmills, flour-mills, and other industrial works. The natural waterpower of the city is very abundant. A plant completed in 1906 has a minimum of 30,000 electrical horse-power developed from the St. Louis River, under a fall of 378 feet: this is to be increased to 100,000 horse-power. Other plans are designed to secure 110,000 additional horse-power to operate under a fall of 740 feet. Duluth is the seat of a Protestant Episcopal and a Roman Catholic bishop. It has a public library, a Carnegie library, State Normal School, United States Fisheries building, United States custom house, board of trade, and a hydrographic office. There are 400 acres of parks and 20 miles of boulevards. Lester, Lincoln, and Chester parks, and Famous Boulevard, a drive 500 feet above the lake, command grand views. Fond du Lac, a suburb at the head of navigation from Lake Superior, is one of the oldest towns in Minnesota, having been the site of the Astor trading post in 1752.

The government is administered under the charter of 1900 by a mayor, elected biennially, and a unicameral council. The executive appoints the board of public works, water, light, and fire commissioners, civil service commission, city assessor, and the chief and all members of the police department, and (with the consent of the council) the attorney, health commissioner, and board of health, municipal labor bureau commissioners, city engineer, building inspector, and library and park boards. All other municipal officers, excepting the city clerk, who is chosen by the council, are elected by the people. The city owns and operates its water-works and gas plant. The annual income is about $1,700,000; annual expenditure (including amounts for schools which are separately administered through a school district independent of the municipality), $1,650,000 — $1,000,000 being spent for maintenance and operation. The principal items of expense are: schools, $357,000; fire department, $87,000; water-works, $65,000; police department, $41,000; and gas-works, $22,000. Duluth was first permanently settled in 1853, and takes its name from Daniel Gresolon, Sieur du Lhut, who, in 1679-80, visited this vicinity. In 1870, with a population of about 3000, it was incorporated as a city. Since then its growth has been very rapid, a population of 3483 in 1880 having increased to 52,969 in 1900 and to 64,942 in 1905. Of this number 26,925 persons were of foreign birth and 346 of negro descent.

DULWICH, dŭl'ĭch. A suburb of London, in Surrey, four miles south-southeast of Saint Paul's Cathedral, and near Sydenham (Map: London, F 7). It is chiefly notable for its college and fine picture gallery. Dulwich College, or the College of God's Gift, was founded in 1619 by the actor Edward Alleyn, who is buried in the chapel. The picture gallery was bequeathed to the college by the painter Sir Peter F. Bourgeois, and is noteworthy for its works by Dutch masters. Population of Dulwich division of Camberwell, in 1901, 97,354.

DUMA. (Russ. *Council.*) The best-known bodies bearing this name in Russia are the municipal *dumas* or boards of aldermen and the *Gosudárstvennaia* or State Duma created by Imperial ukase of August 19, 1905. See RUSSIA.

DUMAGUETE, dōō'mȧ-gä'tȧ. The capital of the Province of Eastern Nagros, on the island of Negros, Philippines (Map: Philippine Islands, H 10). It is situated in a flat region on the southeastern coast of the island. The chief industry is the gathering of turtle-shells. Population, in 1903, 14,894.

DUMANGAS, dōō-män'gȧs. A town of Panay, Philippines, in the Province of Iloilo, on the river of Jalour, or Dumangas, 24 miles northeast of Iloilo (Map: Philippine Islands, G 9). It is situated in a fertile and well-watered region. The town was founded in 1572. Population, in 1903, 12,428.

DUMANGAT, dōō'mȧn-gät'. The Tagal name for a Negrito people of Alabat Island and northeastern Luzon. See PHILIPPINES.

DUMANJUG, dōō'mȧn-HōōG'. A town of Cebú, Philippines, situated on the coast at the mouth of the river of the same name, 42 miles from Cebú. Population, in 1903, 22,203.

DUMAS, dụ'mȧ', ADOLPHE (1806-61). A French author and poet, born at Chartreuse de Bon Pas, Vaucluse. He wrote *Les Parisiennes* (1830); *La cité des hommes* (1835); and *Le camp des croisés* (1838). His poems, *Un liame de rasin* (1858), were written in the "langue d'oc."

DUMAS, ALEXANDRE, called DUMAS PÈRE (1802-70). The greatest French romantic novelist and the most universally read story-teller of the world, born at Villers-Cotterets, July 24, 1802. As a writer he is remarkable for great creative rather than for artistic genius. Dumas's father was a gallant general, Alexandre Davy de la Pailleterie Dumas, who served Napoleon with distinction, but died in neglect in 1806. This general's father was a rich colonist of Haiti, Marquis Alexandre Davy de la Pailleterie; his mother was a negress of Haiti, from whom the general took the name Dumas. His legitimacy is not clear. The novelist, Alexandre, inherited much from his negress grandmother, in both appearance and nature; much, too, from his marquis grandfather. The contrast and combination can be constantly noted in his novels. His boyhood was passed in Villers-Cotterets. His awkward age and calf-love are painted ingenuously in his *Mémoires* and in *Ange-Pitou*. It was intended to train him for the Church; but he inclined at first to law and was apprenticed to a notary of Soissons, where he saw, in 1819, a play of Ducis (q.v.) that determined him to seek his fortune on the stage. He reached Paris in 1823, with 20 francs and hope for all his patrimony. He found a temporary livelihood as secretary in the household of the future King, Louis Philippe, and in 1829 was among the first to begin the romantic revolt on the stage in his *Henri III. et sa cour*. A stream of dramas followed that brought him notoriety and wealth, spent as soon as won. He appears to have been active in the Revolution of 1830; but proved a too ebullient republican to find favor in the royal household, and resigned his post. He now turned to fiction, and contributed to the newly founded and since famous *Revue des Deux Mondes* the first of his historical novels, *Isabelle de Bavière*, out of which there grew in his fertile brain a scheme for turning the whole history of France into a sort of human comedy that should "exalt history to the height of fiction," and let a romantic fancy play around the evidences of the past. The *Chroniques de France* that resulted from this idea are Dumas's best work. They have, indeed, no historic insight and no grasp of character; but they have a wonderful dramatic instinct to fuse and recast historic materials into chaplets of episodes that are by turns frolicsome and wild, extravagant, breathless, and impetuous, subordinating description to dialogue and everything to action, never failing to absorb the reader and to excite an intense curiosity. In their historical order these chronicles are: *Le bâtard de Mauléon; Duguesclin; Isabelle de Bavière; La reine Margot; La dame de Montsoreau; Les quarante-cinq; Les trois mousquetaires* (the best); *Vingt ans après; Le vicomte de Bragelonne; Le chevalier d'Hermantal; Une fille du régent; Joseph Balsamo; Le collier de la reine; Ange-Pitou; La comtesse de Charny; Le chevalier de Maison-Rouge; Les blancs et les bleus; Les compagnons de Jéhu;* and *La rose rouge*—the whole forming a series of well-nigh a hundred volumes.

Like the writers of the sixteenth century, Dumas took his material where he found it, having barbaric ideas of literary property. Already in 1832 a well-founded accusation of plagiarism had forced him to travels, of which he has left a lively series of *Impressions* (consult Wormeley, *Journeys with Dumas*, Boston, 1902). It did not lead him to mend his ways, however. Volumes have been written about his 'novel factory,' of his purchase of work by unknown authors or translators, and of publishing under his name what he had not so much as read (consult Quérard's *Les supercheries littéraires*, 1859). He was always ready to buy ideas; he was willing to buy novels and rewrite them; he also supplied ideas and let others do the mechanical work of composition; and in later life he may have been even less scrupulous; but none who claimed to share his honor as well as his profits ever did under their own names work like that which they claimed to have done for him, and we know that Dumas was as rapid and industrious a penman as he was a facile composer. No doubt he squandered his genius under the urgent demands of the press.

His best work was almost all done between 1843 and 1850—the inimitable *Comte de Monte Cristo; Les trois mousquetaires; Vingt ans après; La reine Margot; Les mémoires d'un médecin; Les quarante-cinq; Le vicomte de Bragelonne;* and *La tulipe noire*. After that we catch only an occasional flash of genius, as in *Les blancs et les bleus* (1868). In one way or another Dumas is responsible for 298 somewhat closely printed volumes. For a generation he was the world's Scheherazade, doing more than all others together to give French fiction a cosmopolitan audience in the great middle class. His work brought enormous returns, but he was a phenomenon of thriftlessness. He became involved in many lawsuits over contracts signed with thoughtless levity. He built a palace, Monte Cristo, for 500,000 francs, in 1847, then sold it in 1851, and fled from his creditors in 1853. Then for nineteen years he became a pathetic wanderer in search of 'copy.' He visited England (1857), Russia and the Caucasus (1858), and Italy (1860 and 1866). Last came four years of senile poverty, relieved by the son whose boyhood he had neglected and whose youth he had misguided. By him he was taken from the excitements and dangers of Paris in war time to Puys, near Dieppe, where he died on the day of its occupation by the Prussians, December 5, 1870. He was buried in 1872 at his boyhood's home in Villers-Cotterets. A uniform and nearly complete translation of Dumas's novels is published in Boston. Consult: Blaze de Bury, *Alexandre Dumas, sa vie, son temps, son œuvre* (Paris, 1885); Wells, *A Century of French Fiction* (New York, 1898); Parigot, *Le drame d'Alexandre Dumas* (Paris, 1898); id., *Alexandre Dumas père* (ib., 1902); Spurr, *The Life and Writings of Alexandre Dumas* (New York, 1902).

DUMAS, ALEXANDRE, called DUMAS FILS (1824-95). One of the most distinguished of modern French dramatists. He was born in Paris, July 27, 1824, the son of the great romantic novelist of like name, but of a genius strangely contrasted. In him the father's rich but riotous fancy yielded to close observation and realistic earnestness that made of him an unbending and almost a Puritan moralist. Like his grandfather, an illegitimate child, he has drawn, in *L'affaire Clémenceau* (novel, 1867; dramatized, 1887), a moving picture of the torments caused by his origin during his school life. Later he became the companion and associate of his bohemian father, and after a brief carnival found himself, in 1848, with 50,000 francs of debt and a pen for his assets. It proved more than sufficient. He left old associations forever behind, sold his experience to the world in a novel, *La dame aux camélias* (1848; dramatized, 1852), and became a serious, hard-working author and soon an independent and wealthy one. His other early novels and a first dramatic essay (1845) are romantic commonplace, and have no significance. But the dramatization of *La dame aux camélias* marks a date (February 2, 1852) in the history of the French stage, and inaugurates the realistic study of social problems that has changed the face of the modern drama. Dumas joined Balzac's insight into character to Scribe's technical aptitude, and to an instinct that truth, to be dramatically effective, must be logical and conventional in its exhibition. In so far Dumas is not a 'naturalist,' though he is eminently a dramatic realist. His other plays, in their order, are: *Diane de Lys* (1853); *Le demi-monde* (1855); *La question d'argent* (1857); *Le fils naturel* (1858); *Un père prodigue* (1859); *L'ami des femmes* (1864); *Les idées de Madame Aubray* (1867); *Une visite de noces* (1871); *La princesse Georges* (1871); *La femme de Claude*

(1873); *Monsieur Alphonse* (1873); *L'étrangère* (1876); *La princesse de Bagdad* (1881); *Denise* (1885); *Francillon* (1887). All these deal realistically with one phase or another of social ethics. Their perennial theme is the baneful influence of romantic love, false sentiment, and chivalrous passion. *La dame aux camélias* had shown him disposed to an open-armed charity toward ladies of easy virtue who aspired to a virginity of the heart after the manner of Prévost's Manon Lescaut and Hugo's Marion de Lorme and Fantine (*Les misérables*). But *Diane* shows sterner stuff, and all the dramas that follow are social sermons, each provided with a frank and forceful preface to enforce its lesson of warning against "those charming, terrible little creatures for whom we ruin, dishonor, and kill ourselves, and whose sole occupation in the midst of this universal carnage is to dress now like umbrellas and now like bells."

In general, the dramas are rather gloomy pictures of relations that, as one of his heroines remarks, "began because I was bored and ended because he bored me." They are very witty, but the wit is not kindly. The style is a marvel of conciseness and clearness, "all muscles, nerves, and action;" the language was at first incorrect, and to the last full of new-coined phrases; the characters are apt to be abstractions, types repeated over and over. Clémenceau's wife, Iza, for instance, is the Countess of Terremonde in *La princesse Georges*, and the Valentine of *Le demimonde* and the incarnate Beast of *La femme de Claude*. But after all reserves have been made, the son of the author of *Monte Cristo* was the most purposeful, forceful, and serious of the French dramatists of the nineteenth century. He died at Marly-le-Roi, November 27, 1895.

Dumas's dramas are collected in seven volumes (1890-93), with two volumes of plays revised and adapted by him, *Le théâtre des autres*. Four volumes of essays, chiefly on social subjects, appear as *Entr'actes* (1878-90). Consult: Lacour, *Trois théâtres* (Paris, 1880); Zola, *Nos auteurs dramatiques* (ib., 1881); Bourget, *Essais de psychologie contemporaine* (ib., 1883); Doumic, *Portraits d'écrivains* (ib., 1892); and Matthews, *French Dramatists* (New York, 1901).

DUMAS, Guillaume Matthieu, Count (1753-1837). A French general, politician, and military historian, born at Montpellier, November 23, 1753. After receiving a military education, he became, in 1776, a captain of chasseurs, and in 1780 accompanied the Comte de Rochambeau to America as aide-de-camp, and took part in the principal actions of the war, including the siege of Yorktown. He returned to France with the rank of major. He was Lafayette's aide-de-camp in 1789, and sided with the Constitutional Liberal Party. In 1791 he was elected to the Constituent Assembly, and the next year was chosen president of that body. During the Reign of Terror he absented himself from France, with some brief intervals. In 1797 he was proscribed as a monarchist, and fled to Holstein. When Bonaparte became First Consul, Dumas was recalled and appointed chief of staff to the army of Dijon. He was subsequently Councilor of State, grand officer of the Legion of Honor, and general of division. In this last capacity he was present at the capitulation of Ulm and the battle of Austerlitz (q.v.), in the latter of which he distinguished himself by high courage and dashing tactics. In 1806 he went with Joseph Bonaparte to Naples, and was made Minister of War. In 1808-09 he served in the French army in Spain and Germany, and after the battle of Wagram he was employed in negotiating an armistice with Austria. In 1810 he was made a count of the Empire. In the Russian campaign of 1812 Dumas filled the arduous post of intendant-general, and after the retreat he fought at Lützen and Bautzen. Subsequent to the defeat at Leipzig he was intrusted with the task of arranging for the capitulation of Dresden; but his conditions were not accepted by the allied powers, and he was arrested and imprisoned until the conclusion of peace in 1814. He was in favor under the first Bourbon Restoration, and held important commissions. Upon Napoleon's return from Elba Dumas was persuaded to take charge of the organization of the National Guard. When Louis XVIII. returned, Dumas was obliged to retire on half pay. In 1818 he was restored to favor and made a member of the Council of State, and in 1828 was a Deputy in the Chamber from Paris. After the events of 1830, in which he took a prominent part, he was made a peer, reëntered the Council of State, and became president of the War Committee. He died October 16, 1837. Besides an important military history, *Précis des événements militaires, 1798-1807* (19 vols., Paris, 1817-26), Dumas left an autobiographical work, *Souvenirs du lieutenant-général comte Matthieu Dumas, 1770 à 1836* (Paris, 1839; English trans. Philadelphia, 1839-40).

DUMAS, Jean Baptiste (1800-84). A distinguished French chemist, born at Alais, in the Department of Gard. He was at first apprenticed to an apothecary in Geneva, and engaged in some scientific investigations that attracted the attenion of De Candolle and Prévost. In 1823 he went to Paris, and was appointed chemical *répétiteur* (tutor) in the Polytechnic School, and then professor of chemistry in the Athenæum. He was afterwards transferred to the Sorbonne, and made a member of the Academy of Sciences. His researches on atomic weights, sulphuric ether, and the phenomena of substitution in organic chemistry attracted attention over all Europe. During the July monarchy he was a member of the Council of Education. After the Revolution of February, he was chosen a member of the Legislative Assembly, and from 1849 to 1851 he held the portfolio of Agriculture and Commerce. After the coup d'état he was made a member of the Senate and of the Superior Council of Public Instruction. Numerous contributions from his pen are contained in the *Annales de l'Industrie* and other scientific journals, and in the *Mémoires de l'Académie*. His chief works are: *Traité de chimie appliquée aux arts* (8 vols., 1828-45); *Leçons sur la philosophie chimique* (1837); *Essai sur la statique chimique des êtres organisés* (1841; 3d ed. 1844), etc. Dumas delivered the first Faraday lecture before the London Chemical Society, in 1869. Consult Hofmann, *Zur Erinnerung au Jean Baptiste Dumas* (Berlin, 1885). See Chemistry ('History').

DU MAURIER, dụ mō'ryā', George Louis Palmella Busson (1834-96). An English artist and novelist, born in Paris. On his father's side he was of French descent; his mother was English. His boyhood was passed in Paris, Belgium, and London, and at the age of seventeen his father placed him in University College, London, expecting to make a scientist of him. On the death of his father (1856), Du Maurier adopted art as his profession, studying in Paris under Gleyre, and in Antwerp under De Kaiser and Van Lerius. Returning to London, he began drawing for *Once a Week*, *Punch*, and the *Cornhill Magazine*, and on the death of Leech (1864) he became permanently attached to *Punch*, to whose pages he contributed those examples of social satiric art now so well known. For his drawings he himself composed the clever legends. He also illustrated Thackeray's *Henry Esmond* and *Ballads*, Foxe's *Book of Martyrs*, and works by Henry James, Thomas Hardy, George Meredith, and others. To *Harper's Magazine* he contributed a series of drawings and two novels—*Peter Ibbetson* (1891) and *Trilby* (1894). The former, a fanciful romance of dream life, was widely read—chiefly, it would appear, through interest in the autobiographic record of the author's life at Passy. The latter, whose scene is the Quartier Latin, met with phenomenal success, and was dramatized in both England and America. Whatever may be thought of the melodramatic presence of Svengali, the study of the artist trio, occupying the earlier portion of the story, is generally regarded as a genuine achievement. Subsequent to Du Maurier's death a third novel, *The Martian*, appeared in *Harper's* (1896-97). He was also a skillful writer of light verse, specimens of which appeared in *Punch* and dispersed through his books. But his reputation will chiefly rest upon that illustrative work for *Punch* through which he smilingly assailed the snobbish and the mean. His drawings possess much grace, charm, and finish, and his peculiar type of woman became known everywhere.

DUMB. See DEAF MUTE.

DUMB AGUE. A common name of a form of intermittent fever, in which there is a cold sensation in place of the shaking chill, and the succeeding fever is present, or of chronic malarial infection in which there is no regular chill, fever, and sweat, but all other conditions are present. See INTERMITTENT FEVER.

DUMBARTON, dŭm-bär′t'n (Gael. *Dumbreaton*, fort of the Britons; called by the Britons *Alchuth*, height on the Clyde). A royal, Parliamentary, and municipal burgh, seaport, and capital of Dumbartonshire, Scotland, on the Leven, near its junction with the Clyde, 13 miles west-northwest of Glasgow (Map: Scotland, D 4). It consists chiefly of a long semicircular street parallel to the river. Its principal public buildings are the Dumbarton Academy and county building. Ship-building, marine-engine and machine making, iron-forging, iron and brass founding, and rope-making are the chief industries. It has regular steam communication with Glasgow, Greenock, and other Clyde ports. Population (municipal burgh), in 1901, 19,864. Dumbarton (Dun Breton) was a city of the British Kingdom of Strathclyde. Alexander II., in 1222, made it a royal burgh. At the mouth of the Leven stands the Castle of Dumbarton, on a steep, rugged, double-peaked basaltic rock, rising to the height of 560 feet. It is one of the four Scotch castles which, by the terms of the treaty of union between England and Scotland, must be maintained. It was for a time the prison of the Scotch hero Sir William Wallace, and served as a residence for Mary, Queen of Scots, prior to her departure for France. Consult Irving, *Dumbarton* (Dumbarton, 1865).

DUMBARTONSHIRE. A county in the west midland division of Scotland, bounded on the east by Loch Lomond, Stirling, and Lanark; on the south by Renfrew and the Clyde estuary; on the west by Lochs Long and Argyll; and on the north by Perth (Map: Scotland, D 3). Area, 246 square miles. The scenery is very romantic. It is a mining and industrial county, the mineral products being coal, freestone, limestone, ironstone, and slates. The north of the county is mountainous and unproductive, but well-cultivated lands lie south of Loch Lomond and along the Clyde east and west of Dumbarton Castle. Population, in 1801, 20,700; in 1851, 45,100; in 1891, 98,014; in 1901, 113,865. Capital, Dumbarton. Consult Irving, *Dumbartonshire* (Dumbarton, 1860).

DUMB-BELL (so called from a fancied resemblance of the balls to bells). A weight used in calisthenic and other physical exercises. It consists of two balls of iron, or, for light exercise, of wood, connected by a bar for a handle. The present form of dumb-bell was in use in England as early as the reign of Queen Elizabeth; and weights, called *halteres*, that were similar to modern dumb-bells, were used by the quoit-players in the early Grecian games. See GYMNASTICS.

DUM′DUM. A town and military cantonment of Bengal, British India, 10 miles southeast of Barrackpur and five miles northeast of Calcutta (Map: India, E 4). It has extensive accommodations for troops, and an ammunition factory. The place is famous in connection with the Mutiny of 1857. It was the scene of the first open manifestation on the part of the Sepoys against the greased cartridge. Population, in 1891, 21,433.

DUMDUM BULLET. A bullet sometimes used in the British Army, where it is styled 'Mark IV.' It resembles the ordinary service bullet, except that the leaden core is left uncovered, and by further making the casing weak at the apex, the bullet spreads out immediately on striking a bone, and tears or splinters the body, usually with fatal results. It was first made at the Dumdum Arsenal in India, whence its name. The reports of the commanding officers in the Chitral campaign of 1895 called attention to the fact that while the service small-bore bullet had immense penetrative power, it did not possess sufficient stopping power; and a man struck by it did not at once suffer shock or disablement, but continued to fight. The wound of the Lee-Metford (the British service rifle) bullet, like that of the Mauser, is a perfectly clean perforation, which in many instances will soon heal. It was to secure greater 'stopping power' that the Dumdum was employed; and although it is under the ban of the Peace Conference, Great Britain still employs it, but only against uncivilized peoples. Great Britain refused to subscribe to the clause condemning this type of bullet, and thus left herself free to retain it. It was used in Egypt in 1895, but not in the Boer-British War of 1899-02.

DUMÉRIL, dṳ′mȧ′rēl′, ANDRÉ MARIE CONSTANT (1774-1860). A French physician and naturalist, born at Amiens. In 1801 he was appointed professor of anatomy and physiology at the University of Paris, where, in 1819, he also obtained the chair of internal pathology, which he occupied for more than forty years. He was also at one time the substitute of Cuvier in the department of natural history of the Ecole Centrale du Panthéon. It was, however, as assistant of Lacépède, in the course of herpetology and ichthyology, at the Jardin des Plantes, that he obtained that wide experience and extensive information which enabled him to write the first comprehensive work on reptiles, entitled, *Erpétologie générale, ou histoire naturelle complète des reptiles*, in collaboration with Bibron (1834-54). His other publications include: *Traité élémentaire d'histoire naturelle* (2d ed. 1807), and *Zoölogie analytique*, etc. (1806).

DUMÉRIL, AUGUSTE HENRI ANDRÉ (1812-70). A French naturalist, son of André M. C. Duméril. He was born in Paris, and studied medicine at the university in that city. In 1847 he was appointed professor of geology at the Collège Chaptal, and ten years later he succeeded his father as director of the Museum of Natural History. He assisted in the preparation of his father's *Erpétologie*, and wrote *Des odeurs* 1843); *Histoire naturelle des poissons* (1865-70); and other works.

DUMÉRIL, EDÉLESTAND PONTAS (1801-71). A French philologist. He was born at Valognes, Normandy, and subsequently removed to Paris. After publishing *La mort de Garin le Loharain* and other examples of mediæval French text, he began the collection of mediæval Latin poetry, published under the respective titles *Poésies latines antérieures au XIIème siècle* (1843) and *Poésies latines du moyen âge* (1847). These works won for him a wide reputation as a Latinist. As an archæologist and historian of literature he published: *Essai sur l'origine des runes* (1844); *Des formes du mariage pendant le moyen âge* (1861); and *Histoire de la comédie* (1864-67).

DUMERSAN, dụ'mâr'säɴ' THÉOPHILE MARION (1780-1849). A French numismatist and playwright, born in the Castle of Castelnau, near Issoudun, Indre. In 1842 he was appointed director of the royal cabinet of coins, after an association of nearly fifty years with that establishment. He wrote about two hundred and thirty vaudevilles, among which the *L'ange et le diable*, a drama in five acts, was very popular. His best work, however, and one which in its way is still referred to as a model of its kind, is the play entitled *Les Saltimbanques* (1838). His principal work on numismatics is the *Notice des monuments exposés dans le cabinet des médailles et antiques* (1829; frequent subsequent editions).

DUMESNIL, dụ'mâ'nêl', MARIE FRANÇOISE MARCHAND (1713-1803). A celebrated French tragic actress. According to the usual account, she was born in Paris, but her first experience upon the stage was gained in the provinces, at Strassburg and elsewhere. She made her début in the Théâtre Français in 1737 as Clytemnestra in *Iphigénie*. Her imposing appearance and power of tragic expression gave her immense control over her audiences. Once, it is related, those in the front seats were so overcome with horror that they fairly retreated before her, leaving their places vacant. Her superiority to her rival, Mademoiselle Clairon, is generally acknowledged, though there were critics who resented the innovations of her forceful genius. Among her great parts were Athalie, Phèdre, Médéa, Sémiramis, and especially Mérope, which won for her both the admiration and the gratitude of Voltaire, its author. She continued upon the stage till 1776, when she retired upon a pension largely supplemented by the favor of the Court. She died at Boulogne-sur-Mer. Consult Coste d'Arnobat, *Mémoire de Marie Françoise Dumesnil* (Paris, 1800), written in reply to an attack upon her by Mademoiselle Clairon.

DUMFRIES, dŭm-frēs'. A royal Parliamentary and municipal burgh, river port, and the capital of Dumfriesshire, Scotland, on the Nith, 9 miles from its mouth in the Solway Firth, 73 miles south-southwest of Edinburgh, and 33 miles west-northwest of Carlisle (Map: Scotland, E 4). It stands on rising ground, surrounded, except toward the sea, by fine, undulating hills, and is irregularly built of red freestone. One of the bridges across the Nith is believed to have been built about 1280 by Devorgilla, the mother of John Baliol, who also erected the Greyfriars' monastery in the chapel of which, in 1306, Robert the Bruce slew the Red Comyn. Saint Michael's churchyard contains the grave of Robert Burns, the poet. The houses in which he lived and the one in which he died are marked with tablets. Among the modern buildings may be mentioned the county building, a Scotch baronial structure, the post-office, Crichton Institution, and the general infirmary. The chief industry is the manufacture of tweeds, hosiery, leather, baskets, and wooden shoes. Its cattle fairs are also of importance, and an import trade is carried on in oilseed cake, beans, and manures. Two objects of interest in the neighborhood are the ruins of Lincluden Abbey and Caerlaverock Castle, an ancient stronghold of the Maxwells. Dumfries is believed to have grown up about an ancient British fortress. It was made a royal burgh by William the Lion. It suffered severely during the Border wars. In 1745 it was the headquarters of the Young Pretender, who appropriated the town's funds. Population, in 1901, 17,081. Consult Maxwell, *History of Dumfries* (Edinburgh, 1896).

DUMFRIESSHIRE. A border county in the southern division of Scotland, on the Solway Firth, having Kirkcudbright on the west (Map: Scotland, E 4). It has 22 miles of coast-line on the Solway Firth, toward which its surface slopes; area, 1072 square miles. The mineral products are coal, limestone, ironstone, lead, and silver. There are extensive lead-mines at Wanlockhead; limestone is quarried in the parishes of Keir and Carmertrees; zinc ore is mined at Abington, and coal at Sanquhar and Canonbie. The chief occupations are agriculture and the raising of cattle, sheep, and swine. Sheep-farms occupy the hills. There are salmon fisheries in the rivers. Population, in 1801, 54,600; in 1851, 78,100; in 1891, 74,245; in 1901, 72,570. Capital, Dumfries.

DÜMICHEN, dụ'mɪᴋ-*en*, JOHANNES (1833-94). A German Egyptologist, a pupil of Lepsius. His numerous works consist almost entirely of editions of Egyptian inscriptions, derived from temples of the Greek and Roman period. He devoted special attention to the very complicated and difficult hieroglyphic writing which prevailed during this period. In 1802 he was appointed professor of Egyptology at Strassburg. Among his works may be mentioned: *Geographische Inschriften altägyptischer Denkmäler* (1866); *Altägyptische Kalenderinschriften* (1866); *Historische Inschriften altägyptischer Denkmäler* (1867-68); *Der Felsentempel von Abu Simbel* (1869); *Der Grabpalast des Patuamenap in der thebanischen Nekropolis* (1884-94).

DUM'MER, Jeremiah (1680-1739). An American clergyman, who spent the latter part of his life as a politician and lawyer in England. He was born in Boston, the brother of William Dummer, Acting Governor of Massachusetts from 1723 to 1728, graduated at Harvard in 1699, and took his doctor's degree at Utrecht in 1703. After preaching for a time in Boston he moved to England, where he left the ministry, practiced law, and became a political lieutenant of Bolingbroke. He rendered valuable services to the Colony of Massachusetts, for which he was the London agent from 1709 to 1721. He is best known as the author of an able *Defense of the New England Charters* (1721), written at a time when Parliament seemed about to annul several of the colonial charters. He also published *A Discourse on the Holiness of the Sabbath Day* (1704) and *A Letter to a Noble Lord concerning the Late Expeditions to Canada* (1709). Consult a brief sketch in Tyler, *A History of American Literature to 1765* (New York, 1876).

DUMMER'S WAR (so called from William Dummer, Acting Governor of Massachusetts from 1723 to 1728). A war (1723-25) between the Abnaki Indians, originating in a dispute over boundary lines, and the border settlers of Vermont and Maine, then under the jurisdiction of Massachusetts. It was marked by numerous petty skirmishes, and by two considerable engagements; one on August 12, 1724, when a company of 208 whites massacred the Jesuit missionary Rale and some 26 Indians, and another on May 9, 1725, when 34 whites under Capt. John Lovewell defeated a much larger body of Indians, after a bloody contest on the site of the present Fryeburg, Maine. Peace was concluded in November, 1725. For a brief account of the war, consult Parkman, *A Century of Conflict* (Boston, 1892).

DÜMMLER, dụm'lĕr, Ernst (1830-1902). A German historian. He was born in Berlin, and was educated at the universities of Bonn and Berlin. In 1858 he became professor of history at Halle. In 1876 he became president of the Historical Commission for the Province of Saxony, and in 1888 he was called in the same capacity to the Central Directorate of the *Monumenta Germaniæ* in Berlin. His publications include: *Geschichte des ostfränkischen Reiches* (2d ed. 1887), for which two prizes were awarded him by German academies; *Kaiser Otto der Grosse* (1876); *Auxilius und Vulgarius. Quellen und Forschungen des Papsttums im Anfang des zehnten Jahrhunderts* (1866); and numerous important contributions to the *Monumenta Germaniæ* and similar publications.

DUMONCEAU, dụ'mōN'sō', Jean Baptiste, Count Bergendahl (1760-1821). A French soldier, born in Brussels. He was colonel of a regiment during the revolt of Brabant against Austria. Upon the suppression of the rebellion he fled to France, and afterwards fought at Jemappes and Neerwinden. In consequence of the bravery and skill displayed by him in these important battles, he was successively promoted to the rank of brigadier-general (1793), commandant of Amsterdam (1794), and lieutenant-general of the Batavian Republic (1795). In 1807 he became Marshal of Holland, in which capacity he successfully conducted the operations against the English in Walcheren (1809). After the union of Holland with France he again distinguished himself in the campaigns of 1813-15. The title of 'the Stainless General' was bestowed upon him by reason of his unsullied record as a soldier.

DU MOND', Frank Vincent (1865—). An American painter, born in Rochester, N. Y. He studied in Paris under Boulanger, Lefebvre, and Benjamin Constant. He received a third-class medal at the Salon of 1890, and a gold medal at the Atlanta Exposition (1895). Many of his subjects are religious, and in this class is "The Baptism;" but "Portia" is a more successful work. His style is rather decorative, and he is noted as a colorist.

DUMONT, dụ'mōN', Albert (1842-84). A French archæologist. He was born at Scey-sur-Saône (Haute-Saône), and was educated in Paris. After lecturing on archæology and the history of art in Rome (1874) and Athens (1875), he became rector of the academies at Grenoble (1878) and Montpellier (1879), and occupied the position of superintendent of higher education until his death. His researches covered a wide field, embracing prehistoric as well as Christian and Byzantine archæology, while his treatment of the ceramic art of Greece reveals the profound scholar and keen, critical artist. Among his numerous important works are the following: *De Plumbeis apud Græcos Tesseris* (1870); *Inscriptions céramiques de Grèce* (1871); *Vases peints de la Grèce propre* (1873); *Les céramiques de la Grèce propre, vases peints et terres cuites* (in collaboration with Chaplain, 1882-90).

DUMONT, Augustin Alexandre (1801-84). A French sculptor, born in Paris. He studied with his father, Jacques Edme Dumont (1761-1884), and with Cartellier. In 1821 he won the Prix de Rome, and afterwards spent some years in Italy. The works of Dumont are very numerous; they were mostly executed for the public buildings and churches of Paris, and are to be found in the Senate, the Hôtel de Ville, at Versailles, and in the churches of the Madeleine and Notre Dame de Loretto. His two best-known works are "Le génie de la liberté" (The Genius of Liberty), a colossal statue in gilded bronze on the July Column (1840), and the colossal bronze statue of Napoleon I. on the Vendôme Column seriously damaged during the Commune, but since restored. His "Study of a Young Woman," "Leucothea and the Child Bacchus," and "Girl Crowned with Flowers," are in the Luxembourg. The boldness and finish, combined with grace, that distinguish the works of this sculptor show the influence of Canova.

DUMONT, Pierre Etienne Louis (1759-1829). A Swiss philosopher, the leading disciple of Bentham, and the great expositor of the Benthamite philosophy. He was born in Geneva, July 18, 1759, studied theology, and after officiating as a minister for a short time in his native town, proceeded to Saint Petersburg in 1783, where he accepted the charge of the French Protestant Church. In 1785 he left Russia, went to England, and became tutor to the sons of Lord Shelburne, afterwards Marquis of Lansdowne. His superior talents, liberal sentiments, and fine character soon recommended him to the distinguished Whigs of that period; with Sir Samuel Romilly, in particular, he formed a close friendship. During the early years of the French Revolution Dumont was in Paris, where he became greatly attached to Mirabeau, regarding whom he has given the world much important information in his *Souvenirs sur Mirabeau et sur les deux premières assemblées legislatives* (which were not published till 1832, three years after the author's death). In 1791 Dumont returned to England, and formed an intimacy with Bentham. This led to the most important event in his life. Deeply convinced of the value of that philosopher's views on legislation, he requested his friend to allow him to arrange and edit his unpublished writings on this subject. Bentham gave him his manuscripts. Dumont labored earnestly and successfully to bring order out of the chaos of Bentham's writings, and gave them a literary form and a currency which contributed powerfully to their influence. In the following works he appears as the interpreter as well as the editor of the philosopher: *Traité de législation civile et pénale* (Geneva, 1892); *Théorie des Peines et des récompenses* (Geneva, 1810); *Tactique des assemblées législatives* (Geneva, 1815); *Preuves judiciaires* (Geneva, 1823); and the *Organisation judiciaire et codification* (1828), a posthumous work. Dumont returned to Geneva in 1814, and became a member of the representative council. He died in 1829 in Milan. Consult: Macaulay, *Review of Dumont's "Recollections of Mirabeau"* (London, 1832); De Candolle, *Notice sur la vie et les écrits de M. Dumont* (Paris, 1829).

DUMONT D'URVILLE, dụr'vēl', Jules Sébastien César (1790-1842). A French navigator, the discoverer of a portion of the so-called Antarctic Continent. In 1820, while on a surveying trip in the Mediterranean, he recognized the artistic value of a Grecian statue, which had just been unearthed, and which is now known as the "Venus of Milo," and announced the discovery to the French Government. In later years he was concerned in explorations around the Australian continent, New Zealand, Van Diemen's Land, and other Pacific and Indian islands for the purpose of finding traces of Lapérouse. In 1836 he submitted to Louis Philippe the plan of a new expedition which was to explore the Antarctic regions. Joinville Island and Louis Philippe Land were both discovered by him in 1838. After an extended cruise in the Pacific Ocean Dumont d'Urville returned to the far south, and on the afternoon of January 19, 1840, discovered a coast-line in about latitude 65° S., longitude 14° E. This was called by the explorer Adélie Land. Clarie Land, a wall of ice, supposed by the Frenchmen to be attached to a land-mass, was discovered on January 30th. These two coasts are supposed by geographers to form part of the boundary of a great land, called for convenience Antarctica, or the Antarctic Continent. Lieutenant Wilkes, of the United States exploring expedition, had sighted another portion of the same coast farther to the eastward early in the morning of January 19. D'Urville was appointed rear-admiral on his return. Eighteen months afterwards he was killed in a railroad accident. Among his publications are: *Voyage pittoresque autour du monde* (1834); and *Voyages au pôle sud et dans l'Océanie* (1841-54).

DUMORTIERITE, dû-môr'tĭ-ẽr-īt. A basic aluminium silicate that crystallizes in the orthorhombic system, has a vitreous lustre, and is of a bright blue to greenish-blue color. It occurs in fibrous forms in feldspar near Lyons, France, and also in Silesia and in Norway, while in the United States it is reported from New York Island and Yuma County, Ariz. It is named after Eugène Dumortier, the French paleontologist.

DUMOULIN, dụ'mo͞o'lăN', Charles (1500-66). A French jurist, born in Paris. He was a member of the Reformed congregation, and became celebrated as a consulting lawyer. He published in 1551 his *Commentaire sur l'édit des petites dates*, a famous argument to show the justice of the action of Henry II. of France in forbidding the exportation of gold and silver from the Kingdom to Rome. This work was promptly condemned by the Sorbonne, and won him the honor of a heresy trial. In 1564 he published the *Consultation sur le fait du concile de Trent*, for which he was imprisoned. His writings, comprising fifty other titles, were published in Paris in 1581 in five folio volumes.

DU MOULIN, John Philip (1834—). A Canadian bishop, born in Dublin, Ireland, and educated at Trinity College. He was ordained priest of the Protestant Episcopal Church in 1863, became curate of Trinity Church in 1866, and in 1870 was made curate of Saint James's Church, Montreal. In 1875 he was appointed first rector of Saint Martin's, Montreal, and in 1896 was elected and consecrated third bishop of Niagara. He was present at the Lambeth Conference of 1897.

DUMOURIEZ, dụ'mo͞o'rē'ā', Charles François (1739-1823). A French general and politician, born at Cambrai, January 25, 1739. His father was a commissary officer in the French Army, and young Dumouriez obtained a commission and fought in the Seven Years' War, retiring in 1763 with the rank of captain, a small pension, and the Cross of Saint Louis. After some years spent in travel Dumouriez was appointed quartermaster-general to the Corsican expedition by the Duke de Choiseul, and was later sent on a secret mission to Poland. Though employed by D'Aiguillon, the successor of Choiseul, Dumouriez fell into disgrace while on a mission in Sweden, and spent the last months of Louis XV.'s reign in the Bastille. Under Louis XVI., however, he was made commandant at Cherbourg, where he commenced the creation of a great naval establishment. In 1788 he was made a major-general, and on the outbreak of the Revolution attached himself at first to Lafayette and Mirabeau, but in 1790 became connected with the Jacobin Club and managed to secure a command in Normandy. In 1792 he became Minister of Foreign Affairs, but resigned to become Lieutenant-General of the Army of the North. He operated successfully against the Duke of Brunswick, who received a severe check at Valmy (September 20), and was forced to abandon the invasion of French territory. He then pressed into the Austrian Netherlands and defeated the enemy at Jemappes, on November 6, 1792. This was the period of his highest power, and for the moment he was the greatest man in France. In 1793, after several small successes, Dumouriez was checked in his career of conquest by the Austrians under Prince Coburg, in the battle of Neerwinden. Denounced at Paris as a traitor, he refused to appear before the bar of the Assembly to answer to the charges. After vainly trying to induce his army to embrace the cause of royalty, Dumouriez in despair deserted to the Austrians, with a few of his officers. The Convention set a price of 300,000 francs upon his head. After wandering through many countries of Europe, he finally settled in England, where he died in exile at Turville Park, near Henley-upon-Thames, March 14, 1823. Besides a multitude of pamphlets, Dumouriez wrote *Mémoires du général Dumouriez* (Hamburg, 1796); and *La vie et les mémoires du général Dumouriez* (3d ed., Paris, 1822-24). Consult: Welschinger, *Le roman de Dumouriez* (Paris, 1890); Griffiths, *French Revolutionary Generals* (London, 1891).

DUM-PALM. See Doom.

DUMPY LEVEL. See Engineering Instruments.

DÜNA, dụnȧ, or Southern Dvina (in contradiction to the Dvina of northern Russia). A river of West Russia, rising in a small lake in the southwestern part of the Government of Tver, nine miles from the source of the Volga. It flows in a semicircle at first southwest, and then northwest, finally forming the boundary between Courland and Livonia, and empties into the Gulf of Riga 10 miles below Riga (Map: Russia, D 3). Its length is about 650 miles. The upper course of the river lies in a broken country, giving rise to numerous rapids. It is navigable through almost its entire length. Ocean steamers can ascend only to Riga, but smaller vessels reach Dünaburg. The traffic on the Düna is very considerable at high water, 2,000,000 tons being annually transported. Some of the tributaries are navigable. The Düna is connected by the Beresina Canal with the Dnieper, and is free of ice in its lower course for over 240 days in the year.

DÜNABURG, dụ′nȧ-bo͞ork (Russian official name Dvinsk). A district town and fortress in the Russian Government of Vitebsk, situated on the Düna, 110 miles southeast of Riga, and 332 miles southwest of Saint Petersburg (Map: Russia, C 3). It is a fortress of the first class and is situated at the junction of three important railway lines, connecting Saint Petersburg, Warsaw, Libau, Riga, and Vitebsk. The chief manufacturing establishments are distilleries, tobacco and match factories, and flour-mills. The commerce is considerable. Dünaburg was founded by the Livonian Knights in 1278, in 1561 became a part of Poland, and in 1772 was incorporated with Russia. Dünaburg was bombarded by the French in 1812, and was occupied by the allied Prussian and French forces under Macdonald in the same year. Population, in 1897, 69,675.

DUNA-FÖLDVAR, dụ′nŏ-fēld′vär (Hung., earth-walled fortress on the Danube, so called from its situation). A town of Hungary in the county of Tolna, on the right bank of the Danube, about 50 miles south of Budapest (Map: Hungary, F 3). It is a railway and steamship station, with a trade in lumber. Pottery is made here, and there are sturgeon fisheries. Population, in 1890, 12,364; in 1900, 12,117.

DUNANT, dụ′näɴ′, Jean Henri (1828—). A Swiss author and philanthropist, founder of the Red Cross Society (q.v.). He was born in Geneva and conceived the idea of founding a society for aiding wounded soldiers while visiting the scene of the battle of Solferino. He wrote *Un souvenir de Solferino* (5th ed. 1871), and delivered lectures advocating relief in war before the Society of Public Utility in Geneva. Soon afterwards a meeting was held in that city which resulted in the Geneva Convention (1864), and the establishment of a permanent international committee. In 1864 the coöperation of ten governments had been obtained and the Red Cross Society was officially established (August 22, 1864). M. Dunant bestowed his entire fortune on various charities. In 1901 he received the Nobel Prize for service in the cause of peace. Besides the work already mentioned, he wrote the following: *Fraternité et charité internationales en temps de guerre* (1st to 7th ed., 1864); *L'esclavage chez les musulmans et aux Etats-Unis de l'Amérique* (1863); *La rénovation de l'Orient* (1865).

DUNBAR′ (Gael., Castle Point). A royal, Parliamentary and municipal burgh, and ancient seaport of Haddingtonshire, Scotland, on an eminence of the rocky coast near the mouth of the Firth of Forth, 29 miles east-northeast of Edinburgh (Map: Scotland, F 4). The harbor, opened about 1844, is admirably suited for fisheries, and large quantities of herring are annually exported. Population (municipal burgh), in 1901, 3581. On the high rocks at the entrance to the new harbor are the ruins of a castle which from the end of the eleventh century was the chief seat of the earls of March. It was once an important stronghold in resisting English invasion. Edward I. took it in 1296, after defeating the forces under Baliol, and Edward II. fled thither after the battle of Bannockburn. It was successfully defended in a siege of six weeks against the Earl of Salisbury by Black Agnes, Countess of Dunbar, in 1339; it sheltered Queen Mary and Bothwell in 1567, and in the same year it was destroyed by the Regent Murray. In September, 1650, Cromwell, at the 'Race of Dunbar,' defeated the Scottish army under Leslie.

DUN′BAR, Paul Laurence (1872-1906). An American poet of African race, born at Dayton, Ohio, and educated in the public schools of Dayton. He worked as a journalist in New York, and on the staff of the Congressional Library. He appeared in public as a reader of his poems, which have been collected under the titles of *Oak and Ivy* (1893); *Majors and Minors* (1895); *Lyrics of Lowly Life* (1896); *Poems of Cabin and Field* (1899); *Lyrics of the Hearth Side* (1899); *Candle-Lightin' Time* (1902); *Lyrics of Love and Laughter* (1903); *Li'l Gal* (1904); *Lyrics of Sunshine and Shadow* (1905). His more mature work, when in dialect, deserves the commendation given it. He also wrote a volume of short stories, *Folks from Dixie* (1897); a novel, *The Uncalled* (1898); *The Sport of the Gods* (1902).

DUNBAR′, WILLIAM (c.1465-1525?). The greatest of the old Scottish poets. Of his life very little is known, but he was born between 1460 and 1465, probably in East Lothian, and is supposed to be the William Dunbar who entered Saint Andrews University in 1475 and graduated as M.A. in 1479. He cannot be traced at all during the next twenty-one years. From his poem, "Visitation of Saint Francis," we learn, however, that he joined the Order of Franciscans and afterwards left it. He says that as a begging friar he traveled from Berwick to Canterbury, and crossed over to Picardy. By 1500 he was in the service of James IV. of Scotland. In that year he was granted an annual pension of £10, afterwards increased to £20, and then to £80. In 1501 he seems to have visited England in the train of the ambassadors sent thither to conclude the negotiations for the King's marriage to Margaret Tudor. Early in 1503, before the Queen's arrival, he composed, in honor of the event, an allegorical poem entitled "The Thistle and the Rose." He seems now to have lived chiefly about court, writing poems, and sustaining himself with hope of preferment in the Church. After the ruinous defeat at Flodden, and the confusion consequent on the King's death and a prolonged regency, Dunbar's name disappears altogether. He probably died between 1520 and 1530. As a poet he possessed a variety of gifts. He is at times as rich in fancy and color as Spenser in the *Faerie Queene;* as homely, and shrewd, and coarse as Chaucer in the *Miller's Tale;* as pious and devotional as Cowper in his *Hymns;* and as wildly grotesque in satire as Burns in his *Death and Doctor Hornbook*. Besides the beautiful allegory cited above, Dunbar wrote another called "The Golden Targe." He is at his very best in the satires "The Two Married Women and the Widow" and "The Dance of the Deadly Sins." His *Works* were edited by Laing (2 vols., Edinburgh, 1834); also by Small and Mackay, for the Scottish Text Society (Edinburgh, 1884-93). Consult Schipper, *William Dunbar, sein Leben und seine Gedichte* (Berlin, 1884).

DUNBAR′TON (Scotland). See DUMBARTON.

DUNBIRD, or DUNKER. See POCHARD.

DUN′CAN, ADAM, first Viscount Duncan of Camperdown (1731-1804). A British admiral, born at Lundie, Forfar, Scotland. He was educated at Dundee, and entered the navy in 1746, became lieutenant in 1755, and fought against the French at Gorée, Africa. In 1761 he was promoted to be commander, served in the expedition against Belle Isle, and in the capture of Havana in the following year. He was engaged at the battle of Cape Saint Vincent, in 1780, and at the relief of Gibraltar two years later. He was promoted to be rear-admiral of the blue in 1789, and became vice-admiral in 1793. In 1795 Duncan was made commander-in-chief of the United English and Russian squadron in the North Sea, and shortly afterwards was appointed admiral. In the Nore Mutiny (1797), Duncan, who was a man of herculean proportions, six feet four inches in height, and strikingly handsome, quelled the disaffection on his vessel by displays of personal strength and the force of his personality. His strategical blockade of Texel with two ships was one of the most effective ever made, and on October 11, 1797, near Camperdown, he destroyed the Dutch fleet on its way to invade Ireland, and took Admiral De Winter prisoner. Ten days later he was created Baron of Lundie and Lord Viscount Duncan of Camperdown. While traveling to Edinburgh he died suddenly at Cornhill Inn, near Coldstream. Consult: James, *Naval History of Great Britain* (London, 1822); Yonge, *History of the British Navy*, vol. i. (London, 1863).

DUNCAN, JOHN (1796-1870). A Scottish theologian and Hebraist, born at Aberdeen and educated at Marischal College. He was sent to Pest, in 1840, as a missionary for the conversion of the Jews, and counted among his converts the celebrated Dr. Edersheim and the Rev. Dr. Adolph Saphir, afterwards a minister of the English Presbyterian Church, London. After his return from Pest, in 1843, he was appointed professor of Oriental languages in New College, Edinburgh, a position which he retained until his death.

DUNCAN, JOHN (1805-49). An African traveler, born near Kirkcudbright, N. B. He enlisted in the army at an early age. In 1842 he went to Africa as a member of the Niger Expedition, and took a prominent part in negotiating treaties with the natives. The party subsequently was stricken with fever, and of the 300 men who had embarked in this expedition, only five, including Duncan, succeeded, after almost incredible hardships, in reaching England. In 1844 Duncan penetrated from the western coast to Whydah, and subsequently passed through Dahomey to Adofidiah. In 1847 he published an interesting account of this expedition in the work entitled *Travels in Western Africa in 1845 and 1846*.

DUNCAN, SARAH JEANETTE. See COTES, SARAH JEANETTE.

DUNCAN, THOMAS (1807-45). A Scottish historical and genre painter, born at Kinclaven, Perthshire. Despite early indications of artistic talent, he was apprenticed by his father to a law writer. He studied painting in the Trustees' Academy, Edinburgh, under William Allen. His first pictures to attract wide attention were a "Scotch Milkmaid" and the "Death of Old Mortality," exhibited in London, at the Royal Institution, in 1829. In 1830 he was made a member of the Royal Scottish Academy, in which he became a professor, first of color, then of drawing. In 1840 he was made master of the Trustees' Academy, Edinburgh, and in 1843 an associate of the Royal Academy. He died in Edinburgh, on April 25, 1845. Duncan devoted himself to portraiture, but his best-known works are genre and historical pictures, taken from the history and life of the Scottish people. One of his best-known paintings is "Prince Charles and the Highlanders Entering Edinburgh," exhibited in London in 1840, into which he introduced the portraits of distinguished Scotchmen of the day. His best-known genre picture is the "Waefu' Heart," from the ballad of "Auld Robin Gray," now hung in the South Kensington Museum. The most interesting of his portraits is his own, exhibited in 1846, after his death. It was purchased by fifty Scottish artists and presented to the Royal Scotch Academy. Duncan's drawing was careful, and his paintings show some gift of color. Consult: Redgrave, *Dictionary of Artists of the English School* (London, 1878); Armstrong, *Scottish Painters* (London, 1888).

DUNCANSBY (dŭŋ'kanz-bĭ) **HEAD** (the *Vervedrum* of Ptolemy). A promontory 210 feet high forming the northeast extremity of Caithness, Scotland, 1½ miles east of John o' Groat's House (Map: Scotland, F 1). It is noted for its extensive sea view, cliff scenery, and interesting geological phenomena.

DUN'CIAD, The (from Eng. *Duns, dunse, dunce*, originally from *Duns man*, follower of John *Duns* Scotus, hence subtle reasoner, quibbler, ultra-conservative, stupid man). A satirical poem by Alexander Pope (q.v.). It was published, in 1728, in three books; to these, in 1741, a fourth book was added, and for the original hero, Lewis Theobald, Pope substituted Colley Cibber.

DUNCKER, dōōŋ'kẽr, Maximilian Wolfgang (1811-86). A German historian. He was born in Berlin, and studied there and at Bonn, where he became involved in the democratic movements and was imprisoned. He became professor of history at Halle in 1842, a member of the German National Assembly in 1848, professor at Tübingen in 1857, and director of the Prussian archives in 1867. His principal work is *Geschichte des Altertums* (5th ed., 1878-83; new series, 1884-86). Among his further publications are *Origines Germanicæ* (1840) and *Zur Geschichte der deutschen Reichsversammlung* (1849).

DUN'COMBE, Thomas Slingsby (1796-1861). An English politician. He was elected to Parliament from Hertford in 1824, assisted in carrying the Reform Bill, and became a prominent member of the extreme Liberal Party. In 1842 he presented to Parliament the Chartist Petition. (See Chartism.) Sir James Graham, the Home Secretary, having sanctioned the opening of the letters of Mazzini, Duncombe vehemently denounced, in the House of Commons, the adoption of the post-office spy system on English soil. Consult *Life and Correspondence of Thomas Slingsby Duncombe* (London, 1867).

DUNDALK, dŭn-dąk'. A municipal borough and seaport, the capital of the county of Louth, Ireland, beautifully situated at the mouth of the Castletown River, 50 miles north of Dublin (Map: Ireland, E 2). It is overlooked on the northeast by the Carlingford Mountains. Dundalk is the chief outlet for the produce of the counties of Louth, Monaghan, and Cavan, and is in daily steam communication with Liverpool. Besides large railway locomotive works, there are breweries, distilleries, tanneries, flax and jute spinning mills, and ship-building yards. The town has numerous educational institutions, including a public library. There are large cavalry barracks here. Population, in 1891, 12,449; in 1901, 13,067. Edward Bruce took Dundalk in 1315, and made it the seat of his court until his death, in 1318, on the battlefield at Faughart. The city was captured by the Puritans under Cromwell in 1649, and by Schomberg in 1689.

DUNDAS'. A town in Wentworth County, Ontario, Can., four miles from Hamilton, on the Toronto, Hamilton and Buffalo, and the Grand Trunk railroads (Map: Ontario, C 4). It has a public library, mills, and factories. Population, 1901, 3173; 1906, 3806.

DUNDAS, Henry, first Viscount Melville and Baron Dunira (1742-1811). A British statesman. The fourth son of Robert Dundas, lord president of the Scottish Court of Session, he was born at Edinburgh, and received his education at the high school and university. He was called to the Scottish bar in 1763, and was successively appointed Deputy Advocate and Solicitor-General. In 1774 he was returned to Parliament for the county of Edinburgh, and in the following year was appointed Lord Advocate for Scotland. Two years after he was made Keeper of the King's Signet for Scotland. His successful career in Parliament was marked by ability rather than political consistency. In opposition to his constituents, he allied himself with the party in power, and became a strenuous supporter of Lord North's administration as one of the most obstinate and cynical defenders of the war with the American colonists. When Lord North resigned in 1782, Dundas continued to hold the office of Lord Advocate under the Rockingham Ministry, and under the Shelburne Ministry he became Treasurer of the Navy. In 1781-82 his investigation of Indian affairs originated the reform movement which led to the impeachment of Warren Hastings in 1786. He subsequently was the ablest coadjutor of Pitt, under whose Ministry he became president of the Board of Control and principal Secretary of State for the Home Department (1791). He also held a great number of other offices. When Pitt resigned in 1801, Dundas did the same. In 1802, under the administration of Addington, he was elevated to the peerage under the titles of Viscount Melville and Baron Dunira. In 1806 he was tried for "gross malversation and breach of duty," while acting as Treasurer of the Navy, but in spite of the splendid array of talent against him he was acquitted on all the charges. After this he took little part in public affairs, but spent most of his time in retirement in Scotland.

DUNDAS, Sir James Whitley Deans (1785-1862). An English admiral. He entered the navy in 1799 and in 1806 became commander. He was flag captain successively to Sir Thomas Parker and Sir Philip Dunham, and became rear-admiral in 1841, and commander in the Mediterranean in 1852, in which year he was again promoted to the rank of vice-admiral. Upon the outbreak of the Crimean War he became chief naval commander, in which capacity he transported the army to the scene of action. His subsequent operations against Sebastopol were severely criticised and in 1855 he was superseded by Sir Edward Lyon. Two years later he was promoted to the rank of admiral.

DUNDAS, Sir Richard Saunders (1802-61). An English admiral, educated at Harrow and at the Royal Naval College. He commanded a vessel in the first war with China. In 1853 he was made a rear-admiral and two years later, upon the resignation of Napier, was appointed Commander-in-Chief of the Baltic fleet which bombarded Sveaborg (August 9-11, 1855) and blockaded the Gulf of Finland. He became vice-admiral in 1858.

DUNDAS, Robert, Lord Arniston (1685-1753). A Scotch jurist. He was admitted a member of the Faculty of Advocates at Edinburgh in 1709, and soon gained a reputation as an able lawyer. In 1717 he was appointed

Solicitor-General, in 1720 became Lord Advocate, and in the next year Dean of the Faculty of Advocates. He was a member of Parliament from Midlothian from 1722 to 1737, and was an active opponent of Lord Hay's administration of Scotch affairs in 1734. In 1737 he became a judge of the Court of Session of Scotland, and from 1748 until his death was Lord President of the court. His son ROBERT (1713-87), also a jurist, was educated at Edinburgh University and studied Roman law at Utrecht and Paris. His career was remarkable in its similarity to that of his father. He was admitted to the Scotch bar in 1737, became an eloquent pleader, and in 1742 was appointed Solicitor-General, which office he resigned in 1748 upon becoming Dean of the Faculty of Advocates. He was appointed Lord Advocate in 1754, and was elected to Parliament from his father's old constituency in Midlothian in the same year. In 1760 he succeeded Robert Craigie as Lord President of the Court of Session, and took the office just seven years after it had been left vacant by the death of his father. He retained the position until his death. Consult: Omond, *Lord Advocates of Scotland;* and *The Arniston Memoirs* (1887).

DUNDAS STRAIT. A passage separating Melville Island from Coburg Peninsula (q.v.), Northern Australia (Map: Australia, E 1). It is 18 miles in width.

DUNDEE′ (Gael. *Duntaw*, fort on the Tay). A royal, Parliamentary, and municipal burgh and seaport, in Forfarshire, Scotland, on the left bank of the estuary of the Tay, 10 miles from the entrance of that river into the sea, 50 miles north-northeast of Edinburgh (Map: Scotland, F 3). The greater part of it is situated on a slope. A handsome esplanade skirts the banks of the river. The new streets are wide and well laid out. The most striking architectural features are: the town hall, in the Roman Ionic style, with a spire 140 feet high; the Albert Institute, including a free library, picture galleries, museum, etc., in fifteenth-century Gothic; the royal exchange, in the Flemish Pointed style of the fifteenth century; the corn exchange, the infirmary, the justiciary and sheriff-court buildings, the post-office, the town church, with the old tower, 156 feet high, restored in 1873; Saint Paul's Episcopal Church, with a tower and spire 217 feet high; a new orphan asylum; University College, founded in 1882 and affiliated with Saint Andrews University; Kinnaird Hall, and a technical institute. Dundee sends two members to Parliament. In 1889 it was raised to the rank of a city. It owns its water, gas, and electric supplies, which net it a substantial profit; maintains cemeteries, markets, slaughter-houses, and public baths. The street railway lines are owned and operated by the municipality. Dundee has several public parks, one of which, the Baxter Park, on a beautiful slope to the eastward of the town, is 37 acres in extent; another, to the westward of the town, occupies the hill of Balgay, and is finely wooded and beautifully laid out, its area being about 36 acres.

Dundee is the chief seat in Great Britain of the manufacture of coarse linen fabrics (osnaburgs, sheetings, ducks, dowlas, drills, canvas, and cordage). Manufactures of jute are extensively carried on, and many varieties of fabric are made from the coarsest nail-bagging to carpets of great beauty. Dundee is also famous for its manufactures of confectionery and marmalade, and is the centre of the whale and seal-fishing trade of Great Britain. Ship-building (both wood and iron) and machine-making are carried on to some extent. Dundee has splendid harbors in addition to the tide harbor, several large wet docks, two graving-docks, and a jetty for vessels drawing more than 24 feet of water. In 1891, 1287 vessels (of which 946 belonged to coast lines) carrying 585,000 tons, entered the port; in 1901 the number of vessels was 1179 with 472,000 tons. The number of vessels belonging to the port fell off from 178 with a tonnage of 124,000 in 1891, to 133 and 99,400 tons in 1901. The exports are spirits, machinery, and mill-work, linen yarn, jute yarn, and manufactures. The imports include wheat, flour, flax, jute, timber, sugar, paper-making materials, oil-seed cake, mineral ores, etc. The total value of imports and exports exceeds annually £4,800,000 ($24,000,000). Dundee is the third port in importance in Scotland. It is the seat of a United States consulate. At the entrance of the Firth, one of the largest iron bridges ever constructed has been built across the Tay. It was opened in 1887, and is more than two miles long. Population, in 1901, 160,871; in 1905 (estimated), 164,269. Dundee was made a royal burgh by William the Lion about 1160. Its strong fortifications made it of the highest military importance, and in the wars between the Scotch and the English it was taken repeatedly by both parties. It was burned by the Duke of Lancaster in 1385, and was pillaged by Montrose in 1645. In 1651 General Monk sacked and burned the town, and massacred one thousand of its inhabitants. From the important part it played in the Reformation, Dundee gained the name of the 'Scottish Geneva.' Consult: Thomson, *History of Dundee* (Dundee, 1874); Peterson, *Saint Andrews and Dundee* (Dundee, 1893).

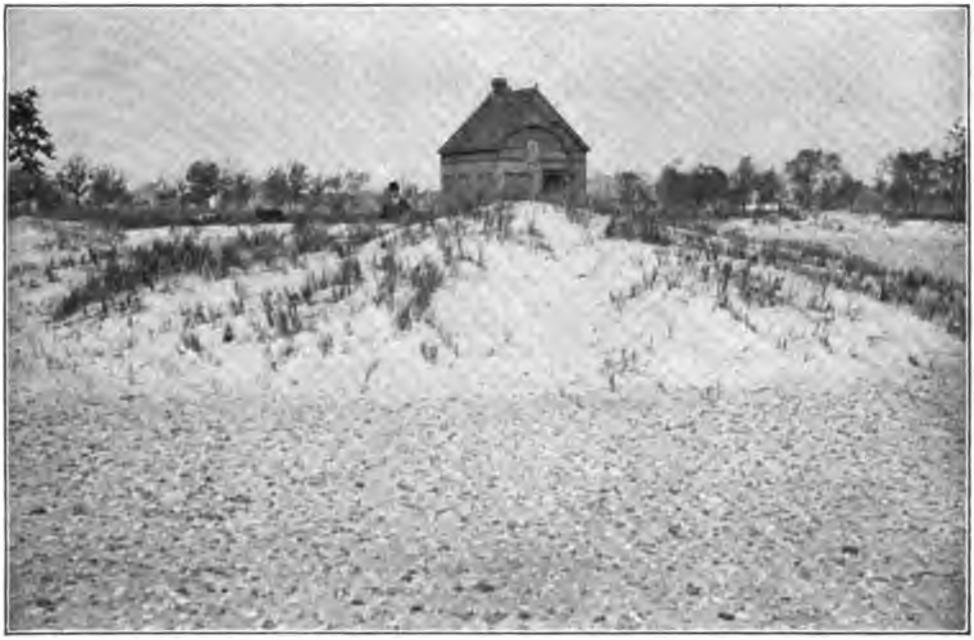
DUNDEE, VISCOUNT. See GRAHAM, JOHN, Viscount Dundee.

DUNDON′ALD, EARL. See COCHRANE, THOMAS.

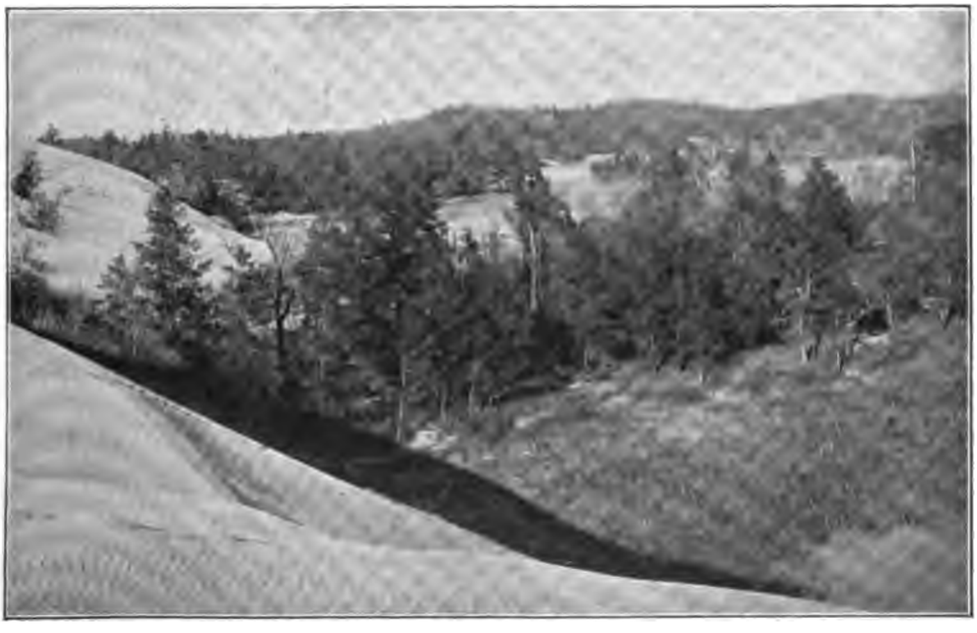
DUNDREAR′Y, LORD. An amusing caricature of the English nobility, in Tom Taylor's *Our American Cousin.* Originally a minor part, it was gradually developed by E. A. Sothern until it became the most prominent character in the play.

DUN′DRUM BAY. An inlet on the coast of Ireland, in County Down, five miles to the south side of Downpatrick. It is about ten miles wide at its entrance, with a uniform breadth of about two and one-half miles (Map: Ireland, F 2). In the inner bay is the famous strand of the champions where ancient Ultonians achieved athletic preëminence.

DUNE (AS., OHG. *dūn*, Ger. *Düne*, Fr. *dune*, from Ir. *dūn*, hill, fort, Welsh *din*, Gall. *dūnon;* ultimately connected with AS., Icel. *tūn*, Eng. *town*, OHG. *zūn*, Ger. *Zaun*, hedge). The name first given to the sand-hills or mounds which stretch along the seacoast of the Netherlands and the north of France. The English term Downs (q.v.) has a similar meaning. Drift sand-hills or dunes are found in all regions of sandy, arid soil, which are subject to brisk and



AN EMBRYONIC SAND DUNE, developing on a beach at Chicago, Ill. The grass which acts as a sand-binder is the Sand Reed (Ammophila).



A LIVING SAND DUNE, at Dune Park, Ind., advancing over swamps and forests, destroying almost everything in its path.

high winds. Along the sandy Atlantic coast of North America, from Cape Cod to Cape Canaveral and beyond, such wind-built hills of moving sands are common features. In this region they are found from five to forty feet in height, while on the coasts of the Bermudas or Bahamas they reach a height of 100 to 200 feet. They also characterize portions of the shores of Lake Michigan, the Caspian Sea, Sea of Aral, and other inland water bodies.

Concerning the growth of the dunes of the Netherlands, W. Chambers's *Tour in Holland* says: "At low water, when the beach is exposed to the action of the winds from the German Ocean, clouds of sand are raised into the air, and showered down upon the country for at least a mile inland; and this constantly going on, the result is, that along the whole line, from Haarlem to about Dunkirk or Calais, the coast consists of sandy mounds of great breadth, partially covered with grass and heath, but unfit for pasturage or any other purpose, and these are the bulwarks which protect the coast. In some places these dunes look like a series of irregular hills; and when seen from the tops of the steeples, they are so huge as to shut out the view of the sea." See DESERT; ÆOLIAN ACCUMULATIONS.

DUNEDIN, dŭn-ē′dĭn. The capital of the provincial district of Otago, in New Zealand, situated on the east side of South Island, at the head of Otago Harbor (Map: New Zealand, S. I., C 6). Dunedin is well laid out, well paved, and lighted by gas. Encircling the city is a reserve called the Town Belt. There are numerous handsome buildings, including many churches, the post-office, hospital, Government buildings, mechanics' institute, and several libraries. Dunedin is the seat of Otago University, opened in 1871, with four faculties; also of a training college for teachers, and a museum with an art gallery. It has municipal water-works and tramways. The United States has a resident consular agent. The city is the see of an Anglican and a Roman Catholic bishop. It is in regular steam communication with Melbourne, and is connected by rail with the principal cities on the island. The principal articles of export are grain, potatoes, and wool, wool and woolen goods being the most important articles of trade and manufacture. From its foundation by an association of members of the Free Kirk of Scotland, in 1848, the city rapidly increased in importance; chiefly after the year 1861, when the discovery of extensive goldfields in the neighborhood caused a sudden increase of population. The population of the city and suburbs (census 1906) was 56,020.

DUNE VEGETATION. Plants which inhabit sandy areas that are or have been worked over by the wind. They form one of the leading edaphic groups of xerophytes (q.v.). Comparatively few plant species are naturally adapted for life in such severe conditions; not only must the plants be pronounced xerophytes, but they must be able to endure partial submergence in the sand. Probably the most characteristic of all beach-dune plants is the sand-reed (Ammophila or Psamma), a plant which grows naturally on dunes all over the Northern Hemisphere; this genus is often planted to aid in holding dunes. Successful beach-dune plants usually have extensive underground stems, and in this way they often cover wide areas.

The most interesting of all dunes are the wandering dunes, since they present peculiar ecological conditions. As a dune moves over a region it often submerges the vegetation in its pathway, whether it be lowland or upland. Very few plants can adapt themselves to the new conditions, though a few species, especially willows, are able to do so; in this latter case the buried stems send out roots. As a dune passes on, the buried plant societies often appear again as soil lines, and sometimes dead trees are shown—a sort of natural graveyard. On the dune itself the vegetation is very slight, because the unstable soil prevents plants from securing a foothold. A few short-lived annuals are occasionally seen, and perennials may be found in protected depressions. If a dune for any reason ceases its movement, vegetation easily finds a foothold, and it is not long before the once wandering dune becomes permanently established and covered with a rich vegetation. These facts show that it is the instability of dunes, rather than their xerophytic character, which excludes plant life. In tropical regions, the dune plants, of course, belong to quite different species, yet their ecological characteristics are the same. There, as in the United States, xerophytic grasses, with long underground stems which have the power to flourish when half buried in the sand, are still the dominating forms. See EDAPHIC; XEROPHYTES; DESERT.

DUNFERMLINE, dŭn-fẽr′lĭn (Gael., fort of the alder-tree pool). A royal burgh and city, and the chief town of the western district of Fifeshire, Scotland, 16 miles northwest of Edinburgh (Map: Scotland, E 3). It was a place of note before the end of the eleventh century, and some interesting fragments of its ancient regal and ecclesiastical magnificence still remain. What is called Malcolm Canmore's tower is a mass of shapeless ruins, but the south wall of the palace of the Stuarts still exists, overhanging the romantic glen of Pittencrief. Of the abbey, the frater hall or refectory and a tower and arched gateway still remain. The Romanesque nave of the abbey church, consecrated in 1150, is 106 feet long and 55 feet wide. Among the noteworthy buildings are the Carnegie Library, Carnegie Baths, Saint Margaret's Hall, the Abbey Church, high school, county and corporation buildings. The staple trade of the town is damask linen weaving, which took its rise about the beginning of the eighteenth century. There are establishments for the spinning of linen yarn, and several large factories where steam and hand loom weaving is carried on. There are also large collieries and lime-works, iron-foundries, breweries, dye-works, and fire-clay works. Population, in 1901, 25,250. At Dunfermline, Malcolm Canmore, in 1080, founded a Benedictine abbey, which was greatly enlarged by David I. in 1150. The palace, of which but few vestiges remain, was frequently visited by the Court, while the abbey became the burial-place of the Scottish kings. Charles I. was born in the palace in 1600. Dunfermline was made a royal burgh in 1588. In the seventeenth century the town was burned by the soldiers of Cromwell. The modern history of Dunfermline is chiefly remarkable in connection with the rise of Scottish dissent: Ralph Erskine, brother of Ebenezer (q.v.), and one of those who joined the latter in the secession movement in 1737, was assistant minister there; and fifteen years later the resistance of the presbytery of Dunfermline to the attempt to force a minister upon a congregation led to the formation of the Relief Church. (See Presbyterianism.) Consult Chalmers, *Historical Account of Dunfermline* (Edinburgh, 1844-59).

DUNFISH. Codfish cured so that they have a dark or dun color. They are split and partially salted, piled away in a dark place, covered with eel-grass, and pressed. They are then uncovered and closely packed for several months, when they are ready for use. The process gives them a peculiar flavor.

DUNGAR′VAN. A municipal borough, seaport, and bathing-place in Waterford County, Ireland, 25 miles west-southwest of Waterford (Map: Ireland, D 4). It has important fisheries and an export trade in grain, butter, cattle, and fish. Dungarvan has the remains of an Augustinian abbey, founded in the seventh century by Saint Garvan. Population, in 1891, 5263; in 1901, 4850.

DUNG-BEETLE. A name given to various beetles of the family Scarabidæ, belonging chiefly to the genera Canthon, Copris, Phanæus, Aphodius, Geotrupes, and Trox. All these beetles breed in dung, either *in situ*, or which they have transported in pellets or balls to burrows in the ground. Thus they are useful as scatterers and disposers of offensive matter. Some forms carry their scavenging propensities still further, and feed on decaying animal matter and on fungi. The American tumblebugs belong to the first three genera enumerated, and are the forms most familiar to us, because they are so frequently seen rolling their pellets along roadways and in pastures. Both sexes unite in the labor of rolling the balls, within which the eggs are laid. *Canthon lævis* is a dull, blackish-brown beetle, the commonest species of its genus. *Phanæus carnifex* of eastern North America has a copper-colored thorax and green elytra; the head of the male is horned. *Copris carolina* is a black, horned species, occurring along the Atlantic slope as far north as Massachusetts. The genus Aphodius has more than one hundred species in America, frequenting the dung of cattle and horses in pastures. The adults are on the wing during warm days of autumn. The most common species is *Aphodius fimetarius*, with red wing-covers. Geotrupes digs breeding-holes in the earth, into which the female rolls chunks of the dung as food for the young. The skin-beetle genus, Trox, feeds on decaying animal hoofs and hair. Dung-beetles have long attracted the attention of man. The Egyptians contemplated them with veneration, placed them in the tombs together with their dead, sculptured and painted them on their sarcophagi, and made imitations of them of various materials, often of precious stones. The ball of dung the Egyptians supposed represented the earth, and the beetles the sun; moreover, they were thought to be a race of males, and hence were the symbol of warriors. This last superstition was carried to Rome. See Scarabæidæ and illustrations on Plate of Beetles. Consult Ward, "A Popular Treatise on Egyptian Scarabs," in *Art and History* (London, 1901).

DUNGEON. See Donjon.

DUNGENESS′. A headland forming the southern extremity of Kent, England, ten miles southeast of Rye (Map: England, H 6). It has a fort and a lighthouse.

DUNG′LISON, Robley (1798-1869). An American physician. He was born in England, was educated in Germany, and in 1824 was called to the chair of medicine in the University of Virginia. From 1833 to 1836 he was professor in the University of Maryland, and from 1836 to 1868 in the Jefferson Medical College in Philadelphia. He was a diligent student, and was the author of a large number of excellent medical books, among which are a *Medical Dictionary* (1833), and *General Therapeutics and Materia Medica* (1857). Consult *Memoir of Dr. Robley Dunglison*, by his son, Dr. R. J. Dunglison (Philadelphia, 1870).

DUNI, do͞o′nė, Egidio Romoaldo (1709-75). An Italian composer. He was born at Matera and studied under Durante at the *Conservatorio dei Poveri di Gesù Cristo* at Naples. He traveled extensively, and in 1757 went to Paris. Here he wrote in all eighteen very melodious operas, distinguished less by dramatic expression than by that sprightly gayety so popular with the French audiences. Among these are: *Le peintre amoureux de son modèle; Le docteur Sangrado; La fille mal gardée; L'île des fous;* and *Les moissonneurs*.

DUN′ITE (named from *Dun*, the Scotch for "hill"). A rock composed almost entirely of olivine. See Peridotite.

DUNKARDS, or **DUNKERS.** See German Baptist Brethren.

DUNKER, do͞on̲′kĕr, Wilhelm Bernhard (1809-85). A German mineralogist. He was born at Eschwege, Hesse, and was educated at Göttingen. He was professor of mineralogy and geognosy at Marburg from 1854 until his death. In association with Hermann von Meyer he founded (1846) the scientific periodical entitled *Paleontographica, Beiträge zur Naturgeschichte der Vorwelt*, of which thirty volumes had been published up to 1883. His principal works comprise the following: *Beiträge zur Kenntniss des norddeutschen Oolithengebildes und dessen Versteinerungen* (with Friedrich Koch, 1837); *Monographie der norddeutschen Wealdenbildung* (1846); *Index Molluscorum Guineensium* (1853); *Mollusca Japonica* (1861); *Index Molluscorum Maris Japonici* (1882).

DUNKIRK, dŭn′kĕrk (Celt., church on the downs), or Dunkerque. A fortified seaport of France, capital of an arrondissement in the Department of Nord, on the Strait of Dover, 155 miles north of Paris, and 28 miles northeast of Calais (Map: France, N., H 1). The town is connected by railway and canal with the principal manufacturing centres of Belgium and France. It is surrounded by ramparts and ditches, and forms part of an extensive system of fortifications, which includes Calais and Gravelines. The harbor is difficult of access and shallow, but the roadstead affords good anchorage. The town is well built, the streets spacious and well paved, the houses chiefly of brick. Its quay and pier, its Church of Saint Eloi—a Gothic structure of the sixteenth century, having a handsome though rather incongruous frontispiece in its more recent Corinthian portico—its town-hall, barracks, college, and theatre, are the principal architectural features. Dunkirk has a fine museum, picture gallery, and public library. There are manufactures of soap, starch, beer, beet-root sugar, cordage, and leather; also metal-foundries, distilleries, salt-refineries, and ship-building yards. Dunkirk ranks fourth among the seaports of France, and its harbor works are on a large scale. The annual value of imports and exports is about $150,000,000. Its cod and herring fisheries are actively prosecuted. The United States is represented by a consular agent. The immediate vicinity of Dunkirk has a dreary and uninteresting appearance. Population, in 1901, 38,925.

Dunkirk owes its origin, it is said, to the church built by Saint Eloi in the seventh century in the midst of a waste of sand-hills or dunes, and hence its name, 'Church of the Dunes.' It shared the fortunes of Flanders, coming successively under Burgundian and Spanish rule. It was burned by the English in 1388. It was taken from the Spaniards by the French in 1658 and made over to England, but was sold to Louis XIV. by Charles II. in 1662. By the Treaty of Utrecht in 1713, the French were compelled to destroy the fortifications of Dunkirk, which were again restored, however, in 1783. Consult Dérode, *Histoire de Dunkerque* (Lille, 1852).

DUNKIRK. A city and port of entry in Chautauqua County, N. Y., 40 miles southwest of Buffalo; on Lake Erie, and on the Lake Shore and Michigan Southern, the Pennsylvania, the Erie, and other railroads (Map: New York, A 3). It has a good harbor, and a large lake trade. The industrial plants include locomotive-works, iron-works, spring and gear works, planing-mills, shirt-factories, axe and axle works, etc. Among the features of interest are the high school building, Carnegie Library, Brooks Memorial Hospital, Point Gratiot Park, and Washington Park. Dunkirk was settled about 1809, was incorporated as a village in 1837, and was chartered as a city in 1880. It is governed, under a revised charter of 1894, by a mayor, elected annually, who controls the appointments to the police and poor department, civil service commission, board of health, and water board; and by a unicameral city council. The board of education is elected by the people. Population, 1890, 9416; 1900, 11,616; 1905, 15,250.

DUNKIRK. A city in Jay County, Ind., 69 miles southeast of Logansport on a line of the Pennsylvania Railroad (Map: Indiana, D 2). It is in the gas belt and has large glass factories. It is governed, under a charter of 1893, by a mayor, elected quadrennially, and a council. It owns its water-works and gas plant. Population, 1900, 3187.

DUN'LAP, WILLIAM (1766-1839). An American artist and author. He was born at Perth Amboy, N. J. In 1784 he went to London and for several years studied painting with Benjamin West. On his return to America he engaged chiefly in dramatic and literary work, producing *The Father*, his best play, in 1789, and becoming manager of the Park Theatre in 1798, where *André* was played the same year. His enlightened administration, which contributed essentially to the development of dramatic art, was continued for several years, but finally resulted in theatrical bankruptcy. Many of his plays have never been published. Returning later to art, he gained reputation throughout the country by religious paintings, of which "Death on the Pale Horse" is most famous. He was founder and an early vice-president of the National Academy of Design. The most noteworthy of his publications is his *History of the American Theatre* (1832). He also wrote biographies of *George Frederick Cooke* (1813) and *Charles Brockden Brown* (1815); *History of the Rise and Progress of the Art of Design in the United States* (1834); and *Thirty Years Ago: or, the Memoirs of a Water Drinker* (1836). The Dunlap Society, founded in 1886, has reprinted *The Father* and *André*.

DUN'LIN (a corruption of *dunling*, from *dun*, in reference to the color + diminutive *-ling*), or REDBACK. A sandpiper of the Northern Hemisphere, which migrates annually between arctic breeding-grounds and the tropics, and is an object of eager sport in the late spring, when it appears in large compact flocks not very difficult to approach. The plumage changes greatly with the season, in winter being prevailingly gray, while in summer the back is chestnut-red, each feather with a black centre, a broad white band covers the dusky wing, and a broad jet-black band marks the abdomen, while the white breast and throat are thickly streaked. It breeds in Europe from Scotland northward, in Kamtchatka, in Alaska, and eastward to Greenland. The European bird is systematically named *Tringa alpina*, and is known in Great Britain as dunlin, purre, ox-eye, etc. The American and Siberian examples are separated in a subspecies, *Tringa alpina Pacifica*, locally known to gunners as blackheart, ox-bird, ox-eye, redback, etc. See Plate of BAY-BIRDS.

DUN'LOP, JOHN COLIN (c.1785-1842). A Scottish critic, author of *The History of Prose Fiction*, born at Rosebank, near Glasgow. He passed most of his life in study, read widely in Greek, Latin, Italian, Spanish, and French, and embodied his knowledge in various histories, of which only *The History of Prose Fiction* (1814; revised 1816) is important. This work, though very uneven in quality, has never been superseded. Its most valuable sections are those dealing with Italian and Spanish fiction. It was translated into German in 1851, and revised in 1888 (London and New York).

DUN'MORE. A borough in Lackawanna County, Pa., adjoining Scranton, on the Erie and the Lackawanna railroads (Map: Pennsylvania, K 3). The borough is the centre of extensive anthracite coal, brick, iron, and silk interests. Under a charter of 1862, the government is vested in a burgess, elected every three years, a borough council, and administrative officials, the majority of whom are chosen by popular vote. Dunmore was settled in 1835 and incorporated in 1862. It has several charitable institutions, among them homes for foundlings and the friendless. The population in 1890 was 8315; and in 1900 it had increased to 12,583.

DUNMORE, JOHN MURRAY, Earl of (1732-1809). An English Governor of Virginia. He sat in the House of Lords in 1761-69 as a representative peer of Scotland; in 1770 was appointed Governor of the Colony of New York, and in 1771 of that of Virginia. He dissolved the House of Assembly in 1772, 1773, and 1774—on the last occasion because of the resolution of that body to observe June 1st, the day for the closing of the port of Boston, as a time of public fast. He commanded a division of Virginia troops in Dunmore's War (q.v.), upon the conclusion of which he made an important treaty with the Indians. In April, 1775, he removed a part of the powder stores from Williamsburg to the war-ship *Magdalen*. Thereupon the colonists in large numbers volunteered for military service under the direction of Patrick Henry. During a session of the House, in June, a riot occurred, and Dunmore transferred the seat of government to the man-of-war *Fowey*, twelve miles off Yorktown. The Burgesses finally declared that the Governor had abdicated, and vested a committee of safety with executive powers. Dunmore equipped a flotilla, with which he unsuccessfully attacked Hampton on October 25. He burned Norfolk on January 1, 1776. On July 8 he was forced by Andrew Lewis (q.v.) from the station which he had taken on Gwynn's Island, in the Chesapeake, and shortly afterwards, having burned the smaller vessels and sent the remainder to the West Indies, returned to England, where he sat in the House of Lords until 1787. From 1787 to 1796 he was Governor of the Bahamas. Consult Campbell, *History of Virginia* (1860).

DUNMORE'S WAR. A war in 1774 between the Indians and the whites on the western frontiers of Virginia, so called from Lord Dunmore, then Governor of Virginia, who was accused, apparently with little justice, of having caused it in order to prevent the Virginians from taking part in the approaching war with England. The killing of the family of Logan, a noted Mingo chief (see Logan, John), on April 30, 1774, was the occasion for the outbreak of general hostilities, and for several months thereafter there were frequent Indian attacks of unusual ferocity. The Virginian Government promptly raised a force of about 3000, and in September General Lewis (see Lewis, Andrew), with about 1200 men, marched to the mouth of the Great Kanawha, there to await a second force of about 1300 under Lord Dunmore, who was to start from Fort Pitt. Dunmore subsequently changed his plans, however, and on October 10 Lewis fought alone the important battle of Point Pleasant, which virtually closed the war. (See Point Pleasant, Battle of.) Soon afterwards Dunmore made a treaty with the Indians, whereby the latter agreed not to hunt south of the Ohio and not to molest voyagers on the river. But for this war, it is likely that the migration of settlers to the West would have been almost wholly checked until after the close of the Revolution, and that, in consequence, the western boundary of the United States might have been fixed, by the treaty of 1783, at the Alleghany Mountains. The war is sometimes called "Cresap's War," from Captain Michael Cresap, who was unjustly charged with having murdered Logan's family. Consult: Roosevelt, *Winning of the West* (vol. i., New York, 1889-94); and Perkins, *Annals of the West* (Pittsburg, 1857).

DUNMOW (dŭn′mō) **FLITCH OF BACON.** A prize instituted at Dunmow, in Essex, England, in 1244, by Robert de Fitzwalter, on the following conditions: "That whatever married couple will go to the priory, and, kneeling on two sharp-pointed stones, will swear that they have not quarreled nor repented of their marriage within a year and a day after its celebration, shall receive a flitch of bacon." The prize was first claimed in 1445, two hundred years after it had been instituted. Only five presentations were made up to 1751, and the flitch was not again claimed till 1855. From 1860 to 1891 there were seven awards. Consult Andrews, *History of the Dunmow Flitch* (London, 1887).

DUNNE, Edward F. (1853—). An American lawyer and political leader, born at Waterville, Conn. He graduated from the Peoria (Ill.) High School in 1870, and from the Union College of Law in 1877. He was Circuit Court judge of Cook County, Ill., from 1892 to 1905, when he was elected mayor of Chicago. He became well known for his advocacy of a municipal ownership policy, and was chosen the vice-president of the National Civic Federation.

DUNNE, Finley Peter (1867—). An American humorist. He was born in Chicago, Ill., and having obtained a common-school education there, served from 1885 to 1891 as a reporter on various newspapers. From 1891 he was editorially connected with the Chicago newspaper press as successively city editor of the *Times* (1891-92), member of the *Evening Post* and *Times-Herald* staffs (1892-97), and editor-in-chief of the *Evening Journal* (1897-1900). He first attracted attention by the publication in the *Times-Herald* of a series of sketches in which, through the medium of one Martin Dooley, publican of Archey Road, he passed humorous comment upon a variety of subjects. With the Spanish-American War he more prominently developed a vein of political and social satire, and upon the publication of *Mr. Dooley in Peace and in War* (1898), a volume of selections, attained wide popularity in America and England. *Mr. Dooley in the Hearts of his Countrymen* (1898), *Mr. Dooley's Philosophy* (1900), and *Mr. Dooley's Opinions* (1901) appeared in continuation. In his shrewd analysis of fault and foible, his ability to 'speak truth smiling,' and speak it with a certain distinctive gusto, 'Mr. Dooley' occupies the leading place among latter-day American humorists.

DUN′NET HEAD. The northernmost point of the mainland of Great Britain in Caithness-shire, Scotland (Map: Scotland, E 1). It is 346 feet high, is crowned with a lighthouse visible 24 miles, and is the ancient *Tarvedrum*, or *Orcus promontorium*.

DUN′NING, Albert Elijah (1844—). An American Congregationalist clergyman, born at Brookfield, Conn. He graduated at Yale University (1867), and at Andover Theological Seminary (1870). After holding the pastorate of the Highland Congregationalist Church in Boston from 1871 to 1881, he acted as general Sunday-school secretary for Congregationalist churches from 1881 to 1889, when he became editor-in-chief of the *Congregationalist*. His principal publications are the following: *The Sunday-School Library* (1883); *Bible Studies* (1886); and *Congregationalists in America* (1894).

DUNNING, John, Baron Ashburton (1731-83). An English lawyer and statesman, born at Ashburton (Devonshire). He studied law at the Middle Temple, was called to the bar in 1756, obtained a high legal reputation, became Solicitor-General in 1768, and in the same year was returned to Parliament for Calne. He very strongly opposed the policy of the Ministry in connection with the American colonies, representing that policy as, "Resist, and we will cut your throats; submit, and we will tax you." In 1774 and again in 1780 he was reëlected to Parliament, in 1782 became a member of the Privy Council, and was appointed Chancellor of the Duchy of Lancaster. He was one of the most prominent lawyers and orators of his day, and was indeed extravagantly praised by contemporaries. He wrote *A Defense of the United Company of Merchants of England Trading to the East Indies* (1762), and has been credited with the authorship of *A Letter to the Proprietors of East India Stock* (1764), a pamphlet entitled *Inquiry into the Doctrines Lately Promulgated Concerning Juries, Libels, etc.* (1764), and a joint share in the *Letters of Junius* (1769-72) (q.v.). Consult Roscoe, *Lives of Eminent British Lawyers* (London, 1838).

DUN'NOCK (ME. *donek*, from *donnen*, *dunnen*, dun + diminutive *-ek*, *-ock;* so called from the color). A familiar folk-name in Scotland and parts of England for the hedge-sparrow (q.v.), one of the commonest of British warblers.

DUNNOT'TAR CASTLE. A ruined castle on the Kincardineshire coast, Scotland, a mile and a half south of Stonehaven. It occupies the top of a rock, 4½ acres in extent, and 160 feet high, overhanging the sea, with a deep dry chasm between it and the mainland. It is approached by a steep winding path. It was the ancient seat of the Keiths, Earls Marischal of Scotland. In 1296 Wallace is said to have taken the rock and the kirk of Dunnottar from the English. During the Commonwealth the regalia of Scotland were hid in the castle from the Republican army, and before the garrison surrendered to Cromwell's troops in 1651, the regalia were removed and secreted in the church of Kinneff. In the time of Charles II. and James II. the castle was one of the State prisons, where the Covenanters were confined. It was dismantled after the rebellion of 1715, on the attainder of the last Earl Marischal.

DUNN'VILLE. A port of entry of Monck County, Ontario, Canada, on the Grand River and the Grand Trunk Railway, 43 miles west of Buffalo (Map: Ontario, D 5). It has agricultural and lumber industries. Population, in 1891, 1776; 1901, 2105.

DUNOIS, dụ'nwä', Jean, Count of (1403-68). A brilliant French soldier, known as 'the Bastard of Orleans.' He was the natural son of Louis, Duke of Orleans, brother of Charles VI., and of Marietta d'Enghien, the wife of Aubert Flamene, Lord of Cauny. He was brought up in the house of his father, who was murdered in 1407. Attached to the Armagnac faction, Dunois was taken prisoner by the Burgundians when they captured Paris in 1418, and was not released until two years later. His friends then advised him to enter the Church, but his own tastes led him to a military life and he attached himself to the party of the dauphin Charles. His first battle was that of Baugé, in 1421. He was endowed with the seignory of Vaubernais in Dauphiné, and married in 1422 Marie Louvet, the daughter of the dauphin's favorite adviser. The same year Charles became King, and made Dunois a councilor and grand chamberlain. In 1424 he was present at the battle of Verneuil, but the retirement of his father-in-law Louvet, through the intrigues of the Constable de Richemont, led Dunois to withdraw for a time from the service of Charles. In 1427, however, he was again prominent and in the relief of Montargis, besieged by the English, in September of that year, laid the foundation of his military renown. He next undertook the defense of Orleans, which he bravely sustained until the arrival of Joan of Arc with aid. Joining their forces for the reconquest of France, Dunois and the Maid of Orleans entered upon an almost unbroken succession of victories which freed France from the English. The capture of Joan of Arc before Compiègne was a sore blow to Dunois, nor could he save her from being burned at Rouen, though he gallantly attempted a diversion in Normandy. Resuming the campaign, Dunois took Chartres, in 1432, and forcing Bedford from in front of Lagny, he laid the way open to Paris. His operations with Richemont in Lower Normandy and around Paris hastened the conclusion of the Treaty of Arras (1435), by which Philip of Burgundy abandoned the cause of England and went over to Charles VII. Dunois refused to sign the treaty because it did not stipulate for the release of his brother, the Duke of Orleans. He was instrumental in expelling the English from Paris and held a place of honor in the royal entry, November, 1437. After procuring the liberation of the princes of Orleans, in 1439, Dunois was more or less involved, for their sake, in the political intrigues of the great nobles against the King, known as the Praguerie. Many new honors and titles were, however, conferred upon him, and between 1446 and 1448 he was employed by Charles VI. on diplomatic missions to England, Burgundy, Savoy, and Rome. The war with England having begun again, in 1449, Dunois was named Lieutenant-General of Normandy, and in a campaign lasting only a year and six days he took all the important strongholds of the English and expelled them from Normandy. Charles VII. designated such a conquest as miraculous, and employed Dunois to do the same in Guienne in 1451, where his triumph was equally complete. It has been maintained that as a reward Dunois was dedeclared legitimate, but this is not proved. During the wars between Charles VII. and the dauphin Louis Dunois held Normandy in the name of the King, and was present at the battle of Castillon in 1453. The last years of the great soldier were spent in State affairs. His services and abilities were at first recognized by Louis XI., who employed him in negotiations with the Duke of Brittany in 1462, but as he did not enjoy the confidence of the King, Dunois, in 1465, placed himself at the head of the League of the Public Weal and was active in negotiating the Treaty of Saint Maur. He died at the Château of Hay, November 24, 1468, and was buried in the Church of Notre Dame de Clery, Louis XI. being present at the funeral. Consult the contemporary chronicles by Monstrelet, Basin, and Berry; also Aimé-Champollion, *Louis*

et Charles d'Orléans (Paris, 1844); Beaucourt, *Histoire de Charles VII.* (6 vols., Paris, 1885-91); Vallet de Viriville, *Histoire de Charles VII.* (Paris, 1862). Dunois appears in Scott's *Quentin Durward.*

DUNOON, dŭn-o͞on′. One of the most frequented sea-bathing places and summer residences in the west of Scotland, situated in the southeast of Argyllshire, on the Firth of Clyde, nine miles west of Greenock (Map: Scotland, D 4). Dunoon Castle, of which only a small part now remains, stood on a conical hill near the pier, and was once a royal palace and strong fortress. Population, police burgh, 1901, 6772.

DUNRA′VEN, WINDHAM THOMAS WYNDHAM-QUIN, Fourth Earl of (1841—). An English politician. He was born at Adare Abbey; was educated at Christ Church, Oxford; entered the army in 1865; and was war correspondent for the *Daily Telegraph* in Abyssinia and during the Franco-Prussian War. In Lord Salisbury's administrations of 1885-86 and 1886-87, he was Under-Secretary for the Colonies, and from 1888 to 1890 was chairman of the House of Lords Committee on Sweating. He has twice competed, unsuccessfully, for the *America's* Cup in the international yacht races. His publications include: *The Great Divide* (1874); *The Irish Question* (1880); *Self-Instruction in the Theory and Practice of Navigation* (1900).

DUNSINANE, dŭn′sĭ-năn′. One of the Sidlaw Hills, in the east of Perthshire, Scotland, 1012 feet high, seven miles northeast of Perth, facing Birnam Hill (q.v.) (Map: Scotland, E 3). On the summit are the remains of 'Macbeth's Castle,' an ancient fortification.

DUNS SCO′TUS. One of the greatest thinkers of the Middle Ages, who, by his acumen, won for himself the title 'Doctor Subtilis,' or 'Subtle Teacher.' He was born either in 1265 or in 1274. The place of his birth is not known. England, Scotland, and Ireland all claim him. He entered the Order of Franciscans, studied at Oxford, and in 1301 became professor of theology there. His prelections were attended by crowds of auditors. In 1304 he removed to Paris, and in 1308 to Cologne, where he died in November of the same year. The general principles of the Scotist system of philosophy deviate only in some points from the Thomist doctrine. Duns Scotus establishes the necessity of revelation on the ground that reason does not teach us clearly and plainly the highest end of our existence—the intuition of God. In addition to natural knowledge or philosophy, revelation is necessary to enable man to know the fullness of truth, and, on the basis of this knowledge, to fulfill his eternal destiny. Revelation, therefore, supplements and perfects this knowledge; and consequently no contradiction can exist between them. The object of theology is God, as God "*sub ratione deitatis,*" while philosophy only treats of God in as far as He is the first cause of things. Theology is a practical science, directed not so much to the removal of ignorance as toward the furtherance of our salvation. The incorruptibility and immortality of the human soul he holds to be a truth of faith, which cannot be demonstrated by reason. Duns Scotus was a realist in philosophy (see NOMINALISM), and yet maintained that universals do not need to be differentiated to become individuals. Individuality is original, and the universal, while preëxisting in God's plan, has real existence only in the individuals, from which, by abstraction, the human mind comes to cognize it. The supreme function of mind is for Duns Scotus, not thought, as for Thomas Aquinas, but will; and he maintained the position by acutely pointing out that clear thought presupposes the exercise of will in attention. Will is free, he taught, and not determined by motives. This is true, not only of men, but of God, who therefore does not, as Thomas Aquinas asserts, command an action because He sees it to be good, but makes it good by commanding it. Duns Scotus had numerous adherents, the best known among whom was Francis of Mayro (d.1325). But when the revival of learning came, the 'Dunsmen,' or followers of Duns, 'raged in every pulpit' against the new classic studies, and brought their name into such disrepute as stupid obstructionists that the word dunce (= Dunsman) came to mean a blockhead. The most famous of Duns Scotus's works, besides his commentaries on the Bible and Aristotle, is his commentary on the Sentences of Peter Lombard, called the *Opus Oxoniense,* of which the *Opus Parisiense* is an abridgment. The chief edition of his works is that prepared by his order, and usually assigned to Luke Wadding (12 vols., Lyons, 1639), but it is by no means complete, containing only his philosophical works; nor is it all authentic, as at least one of the volumes is a compilation of lecture notes taken by his hearers. Duns Scotus's works have not received the attention they deserve, and a satisfactory work on his philosophy is still to seek. Consult: Werner, *Duns Scotus* (Vienna, 1881); Pluzanski, *Essai sur la philosophie de Duns Scotus* (Paris, 1887); Siebeck, "Die Willenslehre bei Duns Scotus und seinen Nachfolgern," in *Zeitschrift für Philosophie* (Berlin, 1898); Royce, *Conception of God* (New York, 1898); also the histories of philosophy by Ueberweg, Erdmann, Windelband, and Höffding.

DUN′STAN, SAINT (925-88). An English archbishop and statesman. He was born at or near Glastonbury in 925, and was educated by certain Irish scholars living at the school attached to the old monastery of Glastonbury. Dunstan became a learned scholar, and he was also a musician, a painter and a calligrapher, and a worker in metals. After a short time at Court, he became a monk and acquired a great reputation for sanctity. Near the church at Glastonbury he erected a cell, five feet in length by two and one-half in breadth, the floor sunk beneath the surface, while the roof on the outside was only breast-high. Here, after distributing all his goods to the poor, for he had inherited riches, he led an ascetic life, and the fame of his sanctity spread. He also devoted himself to the study of Scripture and the Fathers of the Church, and became one of the most learned men of his times. On the accession of Edmund to the throne in 940, Dunstan was recalled to Court. The King made him Abbot of Glastonbury (c.945), and increased the privileges of the monastery. Under Edmund's successor, Edred, Dunstan enjoyed great favor and now began to distinguish himself as a statesman. It was probably to Dunstan that the complete subjugation of the Northumbrian Danes was due. He also instituted religious reforms and removed all those in holy orders who refused to abandon concubinage. Edred was succeeded by Edwy in 955. On the day of the King's coronation, Dunstan publicly rebuked him for seeking an uncanonical marriage, and so won his ill-will and that of his wife's family. He was deprived of his offices and banished (956), and his reforms were checked. He fled to Flanders, where he was well received, and lived in Ghent. He returned to England in 958, and was made Bishop of Worcester; in 959 he became Bishop of London, and in 960 Archbishop of Canterbury. King Edgar, who succeeded Edwy in 958, heartily sustained Dunstan's reforms, and, seconded by Oswald, Bishop of Worcester, and Ethelwald, Bishop of Winchester, Dunstan with characteristic energy labored efficaciously for the regeneration of the clergy and the moral advancement of the people. Under Dunstan's counsel Edgar's reign was vigorous and successful. On the death of Edgar, in 975, Dunstan espoused the cause of Edward the Martyr, and succeeded in placing his favorite on the throne. But Ethelred ultimately prevailed, and the power and influence of Dunstan declined. He retired to Canterbury, and died there May 19, 988. Dunstan was a man of much more than ordinary ability. He was ambitious and persistent in following up his purposes, but his ambition and persistency were guided by sagacity and far-sighted statesmanship. It is often said that he introduced the Benedictine discipline into England. But his religious reforms were certainly conceived and started before his visit to Ghent, when he had his first opportunity of becoming familiar with the Benedictine Order. No authentic literary work of Dunstan is extant. Consult: *Memorials of Saint Dunstan*, edited by Stubbs (Rolls Series, London, 1874, a collection of lives, with a valuable introduction); Lingard, *History and Antiquities of the Anglo-Saxon Church*, vol. ii. (London, 1809); Wright, *Biographia Literaria*, vol. i. Anglo-Saxon period (London, 1842).

DUN'STER, Henry (c.1612-59). An American educator, the first president of Harvard College. He was born in Lancashire, England, and was educated at Magdalen College, Cambridge, where he was associated with Jeremy Taylor and John Milton. He emigrated to Massachusetts in 1640, and in the same year became the first president of Harvard College, of which since 1637 Nathaniel Eaton had been 'professor' or 'master.' He rendered invaluable service to the college, but in 1654 was forced to resign his office for having publicly opposed the doctrine of infant baptism. He was an able preacher, and was widely known as a profound scholar and Orientalist. Consult Chaplin, *Life of Henry Dunster* (Boston, 1872).

DUN'TON, John (1659-1733). An English bookseller and author. He was apprenticed to a bookseller of London, in a short time set up in business for himself, in 1685-86 visited the Massachusetts Bay Colony to dispose of a portion of his stock, and, having seen John Eliot and acquainted himself somewhat with the native tribes, returned to London to establish a prosperous new business at the Sign of the Black Raven. Subsequently he was involved in debts, became mentally unbalanced, and published his remarkable *Life and Errors of John Dunton* (1705), a strange mixture of nonsense and valuable information regarding himself and many other personages of the time. He published the weekly *Athenian Mercury* (originally the *Athenian Gazette*), from 1690 to 1696, and in 1717 entered into arrangements with Defoe for the publication of another weekly, to be called *The Hanover Spy*. His many political tracts in support of the Whigs were unrecognized by the Ministry.

DÜNTZER, dụn'tsẽr, Johann Heinrich Joseph (1813-1901). A German philologist and literary historian, born in Cologne. He studied at the universities of Bonn, Cologne, and Berlin, and in 1846 was appointed librarian of the public library in the Catholic gymnasium at Cologne. His publications on philological subjects include *Die Lehre von der lateinischen Wortbildung* (1836); *Kritik und Erklärung der Horazischen Gedichte* (1840-46); *Verzeichnis der römischen Altertümer des Museums Wallraf-Richartz in Köln* (3d ed. 1885); and school editions of *Homer* (2d ed. 1873 et seq.), and *Horace* (with Latin commentary 1849; with German commentary, 1868-69). He also published more than twenty biographical and critical works on Goethe, of which the biography entitled *Goethes Leben* (2d ed. 1883) has been translated into English by Lyster (1884). His biography of Goethe, and similar works on Schiller, Lessing, and Herder, are characterized by scholarly research and accuracy, but lack charm of style.

DUNWOOD'Y, Henry Harrison Chase (1842—). An American meteorologist, born in Highland County, Ohio. He graduated at the United States Military Academy in 1866. After serving in the Fourth United States Artillery from 1866 to 1869, he was recorder of the Tactics Board at Saint Louis, Mo., for two years. He was associated as meteorologist with the Signal Office at Washington for nearly twenty years, and upon the organization of the Weather Bureau in 1891 was appointed chief of that department. He founded the weather service in the various States, and systematized the official forecasts and so-called hot and cold wave predictions. In recognition of his important work on the Signal Corps, he was promoted to the rank of major in 1889. His papers on meteorological subjects include the following: *Decrease of Temperature with Elevation and Reduction of Barometer to Sea-Level; Tables of Rainfall and Temperature Compared with Crop Production; Weather Proverbs; Absolute Humidity and Mean Cloudiness in the United States; Geographical Distribution of Rainfall in the United States.*

DUODECIMAL SCALE (from Lat. *duodecim*, twelve). The name given to the division of any unit into twelve equal parts, as the division of the foot into twelve inches. See Notation; Arithmetic.

DU'ODE'NUM. See Intestines.

DUPANLOUP, dụ'päɴ'lōō', Félix Antoine Philibert (1802-78). A French prelate. He was born at Saint Félix, Savoy; was ordained priest in Paris in 1825, and became confessor to the Duke de Bordeaux (afterwards Count de Chambord) in 1827, and Bishop of Orléans in 1849. Under Louis Philippe a leader among the Liberal Catholics, he became under Napoleon the foremost champion of the temporal independence of the

Pope. Before the assembling of the Vatican Council in 1870, he opposed Papal infallibility, but submitted to the decision of the Council. At the close of the war with Germany he was sent as a representative to the National Assembly, where he favored a constitutional monarchy. Dupanloup became a member of the French Academy in 1854 and a Senator in 1875. One of his best works is *De l'éducation* (1855-57). His *Œuvres choisies* were published in 1861. Consult Pelletier, *Monseigneur Dupanloup* (Paris, 1876).

DUPERRON, dụ'pâ'rôɴ', Jacques Davy (1556-1618). A French prelate. He was born at Bern, the son of Protestant parents, who had fled from Normandy to Switzerland. He succeeded in winning a position at Court, and the protection of the Duke de Joyeuse, and became a Roman Catholic. Soon thereafter he was appointed reader to King Henry III., and, though a layman, preached at Vincennes, and on the death of Mary Queen of Scots was chosen to pronounce her eulogy. His success in oratory and his ambition led him to take orders. Toward the end of the reign of Henry III. he attached himself to the Cardinal de Bourbon, whose secrets he is said to have sold to Henry IV. That monarch made him Bishop of Evreux. With Cardinal d'Ossat, Duperron persuaded the Pope to relieve the kingdom of the interdict, and for his services received the cardinal's hat in 1604. In all theological disputes, he took an active part against the Protestants. He wrote many controversial works, some ballads, and an elegy, *L'ombre de M. l'amiral de Joyeuse* (1588).

DUPES, Day of (Fr. *journée des dupes*). The name given in France to November 11, 1630, because on that day Richelieu foiled the enemies who had nearly succeeded in ousting him from the royal favor.

DUPETIT-THOUARS, dụ'p'-tĕ'tōō'är', Abel Aubert (1793-1864). A French naval officer. In 1839 he completed a voyage around the world as captain of the *Venus*. In 1842, he placed the Marquesas Islands, and the following year the whole Society group, under the protection of France. In 1846 he was made vice-admiral and in 1849 was elected to the Legislative Assembly. He published *Voyage autour du monde sur la frégate La Vénus* (1841-49).

DUPETIT-THOUARS, Louis Marie Aubert (1758-1831). A French botanist, born at Boumois, near Saumur. In 1792 he accompanied his brother, Aristide Aubert, a naval commander, to Madagascar and the neighboring islands, where he collected numerous botanical specimens. In 1802 he returned to Paris, where he was appointed director of the Royal Institute of Arboriculture. The results of his extensive travels in the Eastern island were published in a series of works of which the publication entitled *Histoire des végétaux recueillis sur les îles de France, de Bourbon et de Madagascar* (1804), is probably the most important.

DUPIN, dụ'păɴ'. André Marie Jean Jacques (1783-1865). A French lawyer and statesman. He was born at Varzy, in the Department of Nièvre, and studied in Paris. After holding a professorship in law, he was elected in 1815 a member of the Chamber of Deputies. The publication of his treatise, *De la libre défense des accusés*, caused him to be chosen as counsel for Marshal Ney and others in the trials for treason and sedition that followed the restoration of the Bourbons. In his pamphlet, *La révolution de 1830*, he endeavored to prove the lawful character of this revolution, and showed himself an ardent defender of the rights of the bourgeoisie. Louis Philippe made him his intimate counselor and procurator-general of the Court of Cassation. In 1832 he became a member of the Academy. From 1832 to 1840 he was president of the Chamber of Deputies. He was on the legislative committee which drafted the new Constitution after the Revolution of 1848, and was president of the Legislative Assembly at the time of the coup d'état. In consequence of the confiscation of the Orléans estates in 1852, Dupin resigned his place, and retired for a time from public life; but in 1857 he consented to resume his previous office of procurator-general of the Court of Cassation. Of his many important works there may be mentioned the *Glossaire de l'ancien droit français* (1846), and *Opuscules de jurisprudence* (1851). Consult his *Mémoires* (Paris, 1855-63).

DUPIN, Chevalier Auguste. The famous character introduced by Edgar Allan Poe as a French detective into several of his short stories, notably *The Murders in the Rue Morgue* and *The Mystery of Marie Rogêt*. The type thus created by Poe was imitated by Conan Doyle in his Sherlock Holmes stories.

DUPIN, Pierre Charles François, Baron (1784-1873). A French economist and politician, brother of André Dupin. He was born at Varzy, in the Department of Nièvre; was educated at the Polytechnic School in Paris; and was afterwards employed as inspector-general of the Marine Department. He traveled in England for the purpose of studying its industries and commerce, and on his return he published *Voyages dans la Grande-Bretagne* (1820-24). In 1819 he was made professor in the Conservatoire des Arts et Métiers, but his interests became more and more centred in politics, in which he at first showed liberal leanings, but finally took up the cause of the Bourbons. In 1828 he was elected Deputy for the Department of Tarn, and took part with the moderate opposition, though Charles X. had made him baron four years earlier. After the February revolution of 1848, Dupin was elected member of the Constituent Assembly and later of the Legislative Assembly; and after the coup d'état he became a Senator for life. His mathematical treatise, *Développement de géométrie pour faire suite à la géométrie pratique de Monge* (1813), gave him membership in the Académie des Sciences.

DUPIN, Louis Ellies (1657-1719). A French Jansenist theologian and historian. He was born in Paris, where he became professor at the Royal College. He was frequently attacked because of his views, which he was several times compelled to retract, and was exposed to severe criticism because of his attitude toward William Wake, Archbishop of Canterbury. His *Bibliothèque universelle des auteurs ecclésiastiques* (58 vols., 1686-1704) is a complete history of the theological literature of the Church and is recognized as a standard work, not only as regards the numerous biographical sketches contained in it, but also because of its exhaustive list of works and the criticisms and other data bearing on them.

DUPLEIX, du'plāks', JOSEPH FRANCOIS, Marquis (1697-1764). A French colonial Governor-General, celebrated as the opponent of British supremacy in India. He was born at Landrecies, a town not far from Valenciennes, January 1, 1697, and was carefully educated by his father, a rich farmer-general. He made several voyages to America and India, which engendered a remarkable aptitude for business enterprise. In 1720 he went as member of the Superior Council to Pondicherry, where he soon gained a large private fortune. In 1731 he proceeded to Chandernagar as Intendant, and in four years, by his energetic and prudent measures, backed by his own capital, had converted that "decayed and lifeless" town into a thriving port. His success received due recognition and in 1742 he received the position and title of "General Commandant of the French possessions in India." He soon disclosed the genius of an empire-builder, with splendid schemes for territorial acquisition, in which he was ably seconded by his wife, Jeanne Albert de Castro, celebrated in Indian annals as Joanna Begum, the 'Princess Joanna.' His efforts, however, to form alliances and to strengthen his position received little support from the French East India Company or the French Government; he was ordered to cease all outlay on the fortification of Pondicherry, but continued the work mainly at his own expense. In 1745 the struggle known as the War of the Austrian Succession, in which France and England were arrayed against each other, extended to the Indian Peninsula. The English East India Company, alarmed at Dupleix's activity, had fortified Madras. At first the French were successful; with the help of Labourdonnais, Governor of the Isles of France and Bourbon, Dupleix repulsed an English attack under Commodore Barnett on Pondicherry, and in 1746 Madras was captured by Labourdonnais, but the results were fruitless, owing to the mutual jealousies of that commander and Dupleix. Dupleix refused to restore Madras to the English according to a compact of bribery entered into by Labourdonnais, and sent the latter, on a charge of treason, to France. The same year Dupleix was ennobled. He was successful in several brilliant engagements against the Nawab of the Carnatic, who had a personal grievance in connection with the retention of Madras; in 1748 he compelled Admiral Boscawen to raise the siege of Pondicherry after an attack of five weeks. The peace of Aix-la-Chapelle put an end to hostilities, and restored Madras to the English, much to Dupleix's chagrin. He, nevertheless, continued his plans and negotiations for the subjection of southern India, and by 1751 the Deccan and the Carnatic were practically under French domination, and Dupleix's dream of making the power of France paramount in India seemed realized. He was inadequately supported, however, and English activity under Lawrence and Clive (q.v.) soon gained the upper hand. Dupleix's splendid work was ended by his recall to France in 1754.

For the company he had expended $1,200,000 of his private fortune. In addition he had advanced large sums to his native allies on the security of the revenue of certain districts. He was never repaid. Neglected by his ungrateful country, the ablest statesman of Louis XV.'s reign was allowed to die in want and obscurity in Paris, November 10, 1764.

Consult: Malleson, *Dupleix* (Oxford, 1890); id., *History of the French in India* (London, 1866); Bionne, *Dupleix* (2 vols., Paris, 1881); Hamont, *Un essai de l'empire français dans l'Inde au dix-huitième siècle; Dupleix d'après sa correspondance inédite* (Paris, 1881); Orme, *A History of the Military Transactions of the British Nation in Indostan, from the year 1744* (4th ed., 3 vols., London, 1803); and compare Macaulay's essay on *Clive* (London, 1840).

DUPLESSIS, dụ'ple-sā', GEORGES (1834-99). A French historian of art, born at Chartres. He was made conservator of the department of prints in the National Library in Paris, and in 1891 became a member of the Académie des Beaux-Arts. His publications include: *Histoire de la gravure en France* (1861); *Les costumes historiques des XVI., XVII. et XVIII. siècles*, with drawings by Lechevallier and Chevignard (1867-73); *Catalogue de l'œuvre de Claude Gélée*, in collaboration with E. Meume (1875); *Histoire de la gravure en Italie, en France en Allemagne* (1880), and *Icones Veteris Testamenti de H. Holbein* (1884).

DU PLESSIS-MORNAY, môr'nā', PHILIPPE (1549-1623). A distinguished French Protestant leader, frequently called 'the Huguenot Pope.' He was born at Buhy, in Normandy, of nominally Catholic parents, who destined him for the priesthood, but early in life he declared himself a Protestant. His convictions were strengthened by visits to Geneva and Heidelberg, then the centre of Calvinism, during four years of travel (1568-72). On his return to France he attached himself to Coligny, whose fate he escaped on the night of Saint Bartholomew. He remained in England for a year, but came back to take up arms for the Huguenot cause. He was captured by Guise at the siege of Dormans in 1575; but, not being recognized, gained his liberty by the payment of a small ransom and took refuge with the Duke of Bouillon at Sedan. Here he married a young widow, Charlotte Arbaleste, whose hatred of Catholicism was equal to his own. Henry of Navarre sent him to England as a personal representative in 1577, and during this period he wrote a number of theological works. On Condé's death in 1588 he was recognized as the head of the Huguenot faction, and had much influence with Henry III., whom he persuaded to legalize the preaching of the reformed doctrine throughout France. He also succeeded in bringing about an understanding between the King and his future successor, and his services were recognized by his appointment as Governor of Saumur, where he made things so difficult for the Catholics that many of them fled from the district. After the murder of Henry III. he took a prominent part in the military and other movements which brought Henry of Navarre to the throne, but the latter's conversion ended his official activity. He lost his position in the King's Council, but retained his governorship, building at Saumur a Protestant church and college for the education of preachers. His scheme for the organization of French Protestants was adopted by the gathering at Sainte-Foy in 1594, and he was concerned in the negotiations which led up to the Edict of Nantes. The principal event of his later years was his famous controversy with Duperron, the learned Bishop of Evreux, who accused him of misquotation and garbling in one of his controversial treatises, and met and routed him in a public disputation. Du Plessis was deprived of his office at the time of the Huguenot rising of 1621, and died in retirement on his estate of La Forêt-sur-Sèvre two years later. Consult his *Mémoires et correspondance*, republished in 12 volumes (Paris, 1824-25); also Ambert, *Du Plessis-Mornay* (Paris, 1847).

DUPLICATION OF THE CUBE. See CUBE.

DUPLOYÉ, dų'plwä'yâ', EMILE (1833—). A French stenographer, born at Notre Dame de Liesse (Aisne). He was for a time an abbé, but afterwards became known as the inventor of a skillful and widely used system of stenography. With his brother Gustave, he published a textbook in exposition of this method (4th ed. 1867). Consult the article by Meyer in No. 436 of the *Archiv für Stenographie* (Berlin, 1885).

DUPONCEAU, dų'pôɴ'sō', PIERRE ETIENNE (1760-1844). A French-American writer and scholar. He was born in France, studied law at the college at Bressuire, and became secretary to Baron Steuben, with whom in 1777 he came to America and entered the Continental army, in which he was commissioned a captain, serving with Steuben in the New Jersey and Pennsylvania campaigns and in the South. He left the army in 1781 and became a translator and correspondent in the office of the Secretary for Foreign Affairs, Robert R. Livingston. He remained in that position until the close of the war, when he settled in Philadelphia, where he began the practice of law in 1785, and attained high rank as an advocate. After the purchase of Louisiana, President Jefferson offered him the appointment of Chief Justice of the Territory, but he declined. In addition to original legal treatises and translations of French and German legal works, Duponceau devoted himself to philology. Among his published works are *English Phonology* (1818); *Exposition sommaire de la constitution des Etats-Unis d'Amérique* (1837); *Mémoire sur le système grammatical des langages de quelques nations indiennes de l'Amérique du Nord* (1838), which won for him a medal from the French Institute; and *Dissertation on the Nature and Character of the Chinese System of Writing* (1838).

DUPONT, dų'pôɴ', PIERRE (1821-70). A French song-writer. He was born in Lyons, the son of a workman; was brought up by his cousin, who was priest of Roche Taillère-sur-Saône; studied in the seminary of Largentières, and afterwards passed a short time in a lawyer's office. His poem *Les deux anges* was printed in 1842, and won a prize in the Academy. Dupont afterwards wrote some republican verses that came near causing his banishment. He owes his popularity to the songs written for the peasants, such as *Les bœufs, Les lapins,* and *Le chanson du pain.*

DU PONT, SAMUEL FRANCIS (1803-65). A United States naval officer. He was born at Bergen Point, N. J.; entered the navy as midshipman in 1815, and subsequently served in various capacities and on various vessels until 1842, when he was raised to the rank of commander. In the Mexican War, as commander of the *Cyane,* he captured San Diego and La Paz, California; served under Commodore Shubrick in the capture of Mazatlan; and, at the head of a naval force, defeated a large body of Mexicans at San José. In 1855 he was promoted to be captain, and in December, 1860, was placed in command of the Philadelphia Navy Yard. In June, 1861, he became president of a board of naval officers appointed to formulate a plan of naval operations against the Confederates, and in September was made a flag-officer. He was in chief command of the expedition which left Norfolk, Va., early in October, and in a series of brilliant operations captured Port Royal, S. C., Saint Mary's, Fernandina, Jacksonville, Fort Clinch, and Saint Augustine, Fla., besides establishing fourteen blockading stations. For this he received the thanks of Congress and was raised to the rank of rear-admiral, his commission dating from July 16, 1862. On April 7, 1863, as commander of nine armored vessels, he made a determined attack upon Charleston, S. C., but was repulsed with considerable loss. Admiral Du Pont was relieved by Admiral Dahlgren in July of that year, and took no further part in the war. For a partial account of his services during the Civil War, consult Ammen, *The Atlantic Coast* (New York, 1883).

DUPONT DE L'ETANG, du'pôɴ' de lä'täɴ', PIERRE, Count (1765-1840). A French general. He participated in the overthrow of the Directory and served with great distinction at Marengo, Jena, and Friedland, but his unsuccessful expedition to Spain in 1808, where he was compelled to surrender his army, brought about his disgrace and imprisonment. After Napoleon's downfall he was Minister of War during the Hundred Days, and during the second restoration became a member of the Privy Council.

DUPONT DE L'EURE, de lẽr, JACQUES CHARLES (1767-1855). A French statesman, born at Neubourg, Normandy. He was an advocate before the Parliament of Normandy in 1789, and held various judicial offices during the Revolution. He entered political life as a member of the Council of Five Hundred in 1798. He was chosen a Deputy from the Eure to the Corps Législatif in 1813, and in the following year was elected to the Chamber of Deputies, by which he was chosen Vice-President. Reëlected in 1815, he was the author of the famous declaration of the Chamber to the Allies, that France would recognize no government that would not guarantee to it the liberties which had been established by the Revolution. From 1817 to 1848 he was a member of the Chamber of Deputies, acting consistently with the Liberal opposition. In 1830 for a few months he held the portfolio of Justice in the first Cabinet of Louis Philippe. After his resignation he continued as a leader of the opposition until the Revolution of 1848, when he was chosen President of the Provisional Government. He retired to private life in the following year. In all his long career his probity and disinterestedness were never questioned, and his sterling honesty and consistent advocacy of constitutional liberty won for him the title of the 'Aristides of the French tribune.'

DUPONT DE NEMOURS, dų'pôɴ' de ne-mōōr', PIERRE SAMUEL (1739-1817). A French statesman and writer on finance, and an exponent of the theories of the physiocrats (q.v.). He was born and educated in Paris. In 1772 he was secretary of the Council of Public Instruction in Poland. He went back to France two years afterwards to assist his friend Turgot in the administration, and with Turgot went into retirement in 1776. In 1782 Vergennes intrusted him with the task of drafting the treaty recognizing the independence of the United States. Subsequently he was a member of the Council of State and Commissary-General of Commerce. During the Revolution he favored a constitutional monarchy, but was compelled to hide when the Republicans triumphed. He was found and imprisoned; but Robespierre's fall saved him. His reactionary attitude in the Council of Ancients made him exceedingly unpopular and caused him to emigrate to the United States in 1799. He returned to France in 1802, but declined all political office, except that of a commissioner to arrange the transfer of Louisiana to the United States. Jefferson requested Dupont to prepare a scheme of national education. The scheme was never adopted in the United States, but some of its features were embodied in the French code. After Napoleon's first downfall, Dupont became secretary to the Provisional Government, and on the restoration of the Bourbons was made a Councilor of State. The return of Napoleon caused him to leave France, and he spent the remainder of his life with his two sons, powder manufacturers, in the State of Delaware. Consult Schelle, *Dupont de Nemours et l'école physiocratique* (Paris, 1888).

DÜPPEL, dụp'pel, or Dybböl. A village in the Prussian Province of Schleswig-Holstein, situated on the peninsula of Sundewitt, 16 miles northeast of Flensburg. Engagements took place here between the Danes and Germans in May and June, 1848, in which the latter were repulsed. On April 13, 1849, the Germans stormed the Danish positions at this place, and in the second Schleswig-Holstein War the strongly fortified lines of Düppel were carried by the Prussians, April 18, 1864.

DUPRAT, dụ'prȧ', Antoine (1463-1535). A Chancellor of France, born at Issoire (Auvergne). He became president of the Parlement of Paris under Louis XII., and Francis I., on his accession to the throne, in 1515, appointed him Chancellor. As such he entered into negotiations with Pope Leo X. regarding the abrogation of the Pragmatic Sanction, and concluded the concordat by which both the Church and the nobility of France were entirely subject to the royal authority. In concluding this agreement he encountered great opposition, chiefly on the part of the clergy and the university, but retained the royal patronage, by which he ultimately secured the Archbishopric of Sens and the cardinalate. He advanced the absolute power of the State and has therefore justly been called the predecessor of Richelieu and Mazarin. It is said that he might have been the successor of Pope Clement VII. but for the influence of Francis I., who desired to retain his services.

DUPRAY, dụ'prȧ', Henri Louis (1841—). A French painter, born at Sedan (Ardennes). He studied in Paris under Pils and Cogniet. His subjects are military only, and in this line he ranks almost with Detaille. His best-known pictures are "La bataille de Waterloo" (1870); "Grande Garde aux environs de Paris pendant le siège" (1872); "Visite de l'Amiral La Roncière Le Noury et du Général Ducrot aux avant-postes pendant le siège"; "Le capitaliste" (1879); and "l'Impératrice Eugénie quittant Paris" (1884).

DUPRÉ, dụ'prȧ', Giovanni (1817-82). An Italian sculptor of French descent, born at Siena. He first practiced wood-carving and then studied under Bartolini in Florence, where he afterwards lived. His first success was "Abel" (1842) and its companion piece "Cain" (1845), both now in the Pitti Gallery, Florence. These were followed by the pedestal for a colossal vase (also in the Pitti), and a design for the monument to the Duke of Wellington. Both show his taste for allegory, which was further developed by his increasing admiration for Canova. When the elaborate façades for Santa Croce and the Duomo were designed by Matas and de Fabris, Dupré received orders for works on both. But he lived to complete only the "Madonna Addolorata" (1860) and the lunette over the main door of Santa Croce, representing the "Triumph of the Cross." At the Paris Exposition of 1867 he was awarded the gold medal, and in 1868 was made corresponding member of the French Institute. His last great work was the monument to Cavour at Turin (1873). Other statues by him include the "Pièta," in the Siena cemetery, called his masterpiece; the "Dying Sappho," and the monument to the Countess Ferrari-Corbelli, in San Lorenzo, Florence. At times Dupré carried realism to an extreme, but his work is forcible, and his anatomy and drapery admirable, though he had the faults of the modern Italian school in abuse of allegory, and lack of repose. His autobiography, *Pensieri sull' arte e ricordi autobiografici*, appeared in 1879 (translated by Peruzzi, 1884). Consult: Frieze, *Giovanni Dupré* (London, 1886); Venturi, *Scritti minori e lettere di Giovanni Dupré, con un appendice ai ricordi autobiografici* (Florence, 1885).

DUPRÉ, Jules (1812-89). A French landscape painter of the Barbizon group. He was born at Nantes, April 5, 1812. His father was a porcelain manufacturer at Parmain, and afterwards in Limousin, and the lad's first experience in design was gained in decorating porcelain in his father's factory. Some sketches which he made in Limousin attracted the attention of amateurs, and Jules was enabled to go to Paris. He was little influenced by his teachers, Laugier and Pils; much more by the paintings of Hobbema and Ruysdael, in the Louvre, and always sought inspiration in Nature herself. In the memorable Salon of 1831, he exhibited fine studies from nature made in Haute Vienne, among which were "Interior of a Forest," "View of Isle Adam," and "Interior of a Courtyard." They attracted great attention, as did his exhibits of 1833: "Evening," "Environs of Paris," and the "Valley of Montmorency." In 1843 he painted his famous "Farmyard," and, at the invitation of Lord Graves, one of his patrons, he visited England in the same year. He was greatly impressed with the English landscapists, especially by Constable, whose work much influenced his. One of the results of this trip was his picture "Environs of Southampton," exhibited in 1835, a wonderful representation of a storm sweeping across an undulating country. In the same year he exhibited a "Wood in Creuse," and "Pasture in Limousin." In the latter picture he has accomplished the difficult task of rendering the effect of a hot summer's day, with its strong contrasts of bright colors just after a rain.

In 1852 he exhibited "Sunset," "Pastureland," and "Entrance to a Village," all excellent works. He did not again exhibit until the Paris Exposition of 1867, to which he sent twelve canvases, including the "Forest of Compiègne," the "Gorge of Eaux Chaudes," and "Pastures of Berry." During the war of 1870 he resided at Cayeux-sur-Mer, and found in its barren and lonely neighborhood subjects which well expressed his own melancholy. The marines which he painted at this time, like his "Moonlight," belong to his best work. After the war fortune began to smile upon him, and in 1872 he was able to buy his now historic house at l'Isle Adam. He passed the rest of his life surrounded by his pupils and friends, to whom he communicated his ideas on art, in an original fashion. In the Exposition of 1889 there were exhibited, besides his older works, eight others which showed his vigor unimpaired, such as a "Road in the Park of Stors," a "Storm at Sea," a "Ravine in Marais." He died at l'Isle Adam, October 6, 1889—a beautiful and unselfish character, loved by all with whom he associated. American museums, both public and private, are rich in his works. The Metropolitan Museum, New York, possesses excellent examples: the "Old Oak," "Hay Wagon," and a landscape, "Summer," and the Vanderbilt Collection, now on exhibition there, is even richer; its "Midday" is one of his best works.

Dupré was one of the greatest painters of the Barbizon School—the dramatist of the group, as Rousseau was the epic and Corot the lyric poet. He was a melancholy spirit, and loved to portray the tragic, the gloomy, the terrible in nature. He attached especial importance to the handling of light in a picture, and, in order to accomplish this, he often made such free use of impasto that his pictures almost became reliefs. His colors are bright; it has been well said that 'he sees nature through a prism.' But they are harmonious, and he excels in his contrasts. He was made Chevalier of the Legion of Honor in 1849, Officier in 1870, and received the Gold Medal of Honor at the Exposition of 1889. Consult: Claretie, *Peintres et sculpteurs contemporains*, deuxième série (Paris, 1899); Hustin, "Jules Dupré," in *Les artistes célèbres; Les hommes du jour: M. Jules Dupré* (1811-79), *par un critique d'art* (Paris, 1879); and the articles by Ménard, in *l'Art* (1879), and by Michel, id., 1883. See bibliography of FONTAINEBLEAU, SCHOOL OF.

DUPRÉ, JULIEN (1851—). A French painter, born in Paris. He studied under Pils and Henri Lehmann. He renders with robust spirit the simple scenes of country life, and is noted for his painting of animals, particularly of cows, and his fresh, brilliant landscapes. In the Luxembourg are his "Mowers of Lucerne" and "Enraged Cow." At the St. Louis Exposition (1904) he exhibited "The Return of the Herd," "Evening," and "Near a Pool."

DUPREZ, dụ'prā', GILBERT LOUIS (1806-96). A French dramatic tenor, born in Paris, and educated at the Ecole de Choron. In 1837 he made his first appearance at the Opéra in the rôle of Arnold in *Guillaume Tell*, and from then until his retirement from the opera in 1849, he remained a favorite with the Parisian public. His writing include *L'art du chant* and *La mélodie*.

DUPUIS, dụ'pwē', CHARLES FRANÇOIS (1742-1809). A distinguished French savant, the son of a poor schoolmaster. He was born at Trie-Château, near Chaumont, and obtained admission into the college of Harcourt, where he so soon acquired extensive knowledge that at the age of twenty-four he was made professor of rhetoric in the college of Lisieux. At the same time he went through a course of law studies, and was admitted an advocate of the Parliament. His acquaintance with Lalande introduced him to the study of mathematics and astronomy, and he was led to the thought of explaining mythology by means of astronomy. After several communications in the *Journal des Savants*, appeared his *Mémoire sur l'origine des constellations et sur l'explication de la fable par le moyen de l'astronomie* (1781). He was now appointed professor of Latin oratory in the Collège de France, member of the Académie des Inscriptions (1788), and shortly after a member of the Commission of Public Instruction. During the Revolution he became a member of the Convention, next of the Council of Five Hundred, and, after the Eighteenth Brumaire, of the legislative body. He was also one of the forty-eight individuals who formed the nucleus of the Institut National. His great work, *L'Origine de tous les cultes, ou religion universelle* (1795), which he had long withheld from fear of offending the religious world, was at last published at the instance of the Cordeliers' Club. This circumstance rendered the book more an object of party bitterness than its own purely scientific character would probably have called forth. It made a considerable impression on France at the time, and no doubt afterwards caused Napoleon to appoint the famous commission to explore Upper Egypt, which Dupuis had pointed out as the general source of southern mythology. No less attention was awakened by his memoirs on the origin and spread of the Pelasgi, and on the zodiac of Denderah (q.v.). In his last work, *Mémoire explicatif du zodiaque chronologique et mythologique* (1806), he attempts to demonstrate the unity of the astronomical and religious myths of all nations.

DUPUIS, NATHAN FELLOWES (1836—). A Canadian educator and author, born at Portland, Ont. He graduated in 1866 at Queen's University (Kingston), and in 1867 was appointed professor of chemistry in that institution. In 1880 he was transferred to the professorship of mathematics. He was for a number of years public inspector of schools for Kingston. His publications include: *Elements of Geometrical Optics* (1868); *Junior Algebra* (1882); and *Elements of Synthetic Solid Geometry* (1893).

DUPUY DE LÔME, dụ'pwē' de lōm. STANISLAS CHARLES HENRI LAURENT (1816-85). A French naval engineer. He was born at Ploemeur, near Lorient, and was educated at the Ecole Polytechnique in Paris, and in England. In 1857 he was chief of department in the Ministry of the Navy, and was subsequently appointed director of naval construction. The *Napoléon*, the first iron steamship constructed in France, was modeled upon the principles laid down in his *Mémoire sur la construction des bâtiments en fer* (1844). The first French screw steamships and the first armored vessels, *La Gloire*, *Invincible*, and *Normandie* (1859), also were built in accordance with his instructions. During the siege of Paris he was a member of the Aërostatic Commission, and in this capacity organized the service which sent out more than fifty balloons from the city before the capitulation. In 1872 he demonstrated the possibility of constructing dirigible balloons.

DUPUYTREN, dụ'pwē'träN', GUILLAUME, Baron (1777-1835). An eminent French surgeon and anatomist. He was born at Pierre-Buffière, in Limousin, was educated at the Collège de la Marche in Paris; and on the formation of a new school of medicine there in 1794, was appointed to the office of prosector. In 1812 he became professor of surgery, and in 1815 chief surgeon to the Hôtel-Dieu. Louis XVIII. conferred on him the title of baron, and appointed him royal surgeon in 1823. Dupuytren was a remarkable diagnostician, as well as a bold and skillful operator, possessed of immovable firmness of nerve. He made several important discoveries in pathological anatomy; and, although he wrote little, he formed a large school of enlightened surgeons in his native country. Among his works may be mentioned: *Leçons orales de clinique chirurgicale faites à l'Hôtel-Dieu* (1830-34); and *Traité théorique et pratique des blessures par armes de guerre* (1834).

DUQUESNE, dōō-kān'. A borough in Allegheny County, Pa., one mile from McKeesport; on the Monongahela River, and on a line of the Pennsylvania Railroad. It has a Carnegie Library and Institute. Its steel-works and blast-furnaces are extensive. Settled in 1885, Duquesne was incorporated in 1891. Under the charter of that date, the government is vested in a burgess, elected every three years, and a borough council. The water-works are owned and operated by the municipality. Population, in 1900, 9036.

DUQUESNE, dụ'kān', ABRAHAM, Marquis (1610-88). One of the most eminent naval officers of France. He was born at Dieppe, and was trained for the naval service. Under Louis XIII. he distinguished himself in the war against Spain. During the minority of Louis XIV., he entered the service of Sweden. Duquesne defeated the Danish fleet near Gothenburg in 1643, was elevated to the rank of vice-admiral, and by a succession of victories over the united fleets of Denmark and Holland, forced Denmark to conclude peace. When the Spaniards prepared to support Bordeaux, which had declared itself for the party of the Fronde in 1650, he collected a squadron at his own expense, and compelled Bordeaux to submit. On the revolt of Messina against the Spanish Government, France sent him to support the insurgents. With a small force, Duquesne gallantly opposed the united fleets of Spain and Holland, commanded by De Ruyter, and in April, 1676, completely defeated his enemies off the coast of Sicily. In 1682 Duquesne cleared the Mediterranean of the Barbary pirates, and in 1684 he bombarded Genoa. Louis XIV. rewarded Duquesne with the title of marquis and a considerable estate. On the revocation of the Edict of Nantes, Duquesne was excepted from the general decree of banishment issued against all Protestants. Consult Plon, *Duquesne et la marine de son temps* (Paris, 1872).

DUQUESNOY, dụ'kā'nwä', FRANÇOIS (1594-1646). A Flemish sculptor, born in Brussels. He studied under his father, who was a sculptor, and then in Italy, where most of his work was done. He modeled the "Groups of Children" for the columns of the high altar at Saint Peter's, Rome, and a statue of Saint Andrew in the same church. His other works include a statue of Susanna for Santa Maria di Loreto, Rome; several works for the churches of Naples (particularly a "Concert of Cherubim," in the Church of the Holy Apostles), and statues in Vienna and Madrid. Cardinal Richelieu, who had heard of Duquesnoy through Poussin, invited him to the Court of Louis XIII., but on his way to France the artist died at Livorno, poisoned, it is said, by his brother Jérôme.

DUQUOIN'. A city in Perry County, Ill., 74 miles southeast of East St. Louis, on the Illinois Central Railroad (Map: Illinois, C 5). It has iron-works, planing mills, flour mills, and extensive coal mines. Under a charter of 1873, its government is vested in a mayor, elected biennially, and a unicameral council of ten members. Population, 1900, 4353.

DURA DEN, dōō'rȧ dĕn. A small glen between Cupar and Saint Andrews, in Fifeshire, Scotland, through which runs a tributary of the Eden, geologically famous on account of the numerous and beautifully preserved fossil fish entombed in its yellow sandstone.

DU'RA MA'TER. See NERVOUS SYSTEM.

DURA'MEN (Lat., hardness, from *durus*, hard). A term applied by botanists to the inner more solid and usually darker heart-wood of conifers and dicotyledons. The dark-colored duramen of some trees, of which a good example is the ebony, is of considerable importance in cabinet-making, while the light-colored sap-wood or 'alburnum' of these same trees is of little value. See WOOD.

DURAN, dōō-rän', AGUSTIN (1789-1862). A Spanish poet and critic, born in Madrid. He was educated for the law in the University of Seville, and admitted as an advocate. In 1834 he was secretary of the board for the censorship of the press, and soon afterwards had a place in the National Library, of which he became a director. He is best known by his poem *Las tres toronjas del verjel de amor* (1856).

DURAN, dụ'räN', CAROLUS (CHARLES AUGUSTE EMILE DURAND) (1837—). A French portrait painter. He was born at Lille, July 4, 1837. He studied under Souchon at the Lille Academy of Art, and afterwards in Paris, where he devoted himself chiefly to copying the old masters in the Louvre, especially Leonardo and Velasquez. In 1861 he obtained the Wicar prize for painting, and went to Italy and Spain, continuing his study of Velasquez, who remained his chief model. While at the Monastery of Saint Francis near Subiaco, during his stay in Rome, he painted his first important work, "The Evening Prayer" (1863). This was followed by "The Assassination" (1866, in the Lille Museum), a picture which shows much dramatic power. After this he turned his attention to portraiture and exhibited "The Lady with the Glove" (1869), a full-length portrait of his wife in outdoor costume, one of his best works, and now in the Luxembourg. This was followed by a series of brilliant portraits. In 1873 he opened an atelier, and many Americans sought his instruction. Among his pupils have been Low, Sargent, and Beckwith. His portraits are usually of women and children. They are essentially modern, lifelike, vivid, and boldly painted. In technique, Duran has rarely been surpassed, but in interpretation of personality his great pupil, Sargent, goes beyond him, and Duran never nearly equals his chosen master, Velasquez, in subtilty of expression. His other works include portraits of Mons. Edouard R. and Madame Feydeau; "Lady with a Dog" (Lille Museum); "At the Seaside;" an equestrian portrait of the actress Mademoiselle Croizette; "Bettina," very much like Velasquez in treatment; the Countess of Vandal; Mme. de Pourtalès, Emile de Girardin, and Pasteur. He also painted a series of historical and genre subjects, in which the influence of Veronese and Rubens is apparent. Among these are the "Bathers," the "Gloria Mariæ Medici," a decorative composition for a ceiling in the Louvre; the "Burial of Christ" (1882); "Dawn," and the "Vision." He received the medal of honor in 1879, and was made grand officer of the Legion of Honor in 1900. At St. Louis in 1904 he exhibited a portrait of Mme. Jaques Stern, "Christ's Last Hour," and "A Thunder Storm." In 1905 he was named director of the French school at Rome. Consult: Stranahan, *History of French Painting* (New York, 1896); and Muther, *History of Modern Painting* (New York, 1896).

DURANCE, dṳ'räɴs'. A river in the southeast of France, rising in the Department of Hautes-Alpes, near the base of Mont Genèvre (Map: France, S., L 4). It flows through the Department of Basses-Alpes in a southerly direction, then, curving westward, proceeds toward the Rhone, forming the boundary between the departments of Vaucluse and Bouches-du-Rhône, and joins the Rhone about three miles below Avignon. Its total course is about 225 miles—no part of which is navigable. It supplies Marseilles with water by an aqueduct 51 miles in length, and irrigates an otherwise arid region.

DURAND, Alice Marie Céleste. See **Gréville, Henri.**

DURAND, Asher Brown (1796-1886). An American painter and engraver, born at South Orange, N. J. In early life he studied engraving, and produced some of the best work ever done in this country. Two of his well-known plates are those after Trumbull's "Declaration of Independence," and "Ariadne," after Vanderlyn (Metropolitan Museum, New York). From 1858 until his death he devoted himself principally to landscape painting, and is one of the most noteworthy of the early American school. His "Mountain Forest" (1869) is in the Corcoran Gallery at Washington, and the Metropolitan Museum possesses four of his works, including "In the Woods," one of his best landscapes. He was the second president of the National Academy of Design (1845-61).

DURAND, Elias (1794-1873). A French-American botanist, born at Mainz. He pursued medical studies, and became a member of the medical corps of the French Army. Upon the fall of the First Empire he emigrated to the United States, and set up an apothecary shop in Philadelphia. He collected an herbarium which included no less than 10,000 species of North American flora, and which he presented to the Museum of the Jardin des Plantes, Paris, where a special gallery was assigned to it.

DURAND, William Frederick (1859—). An American marine engineer, born at Bethany, Conn. He graduated at the United States Naval Academy in 1880, and was a member of the United States Naval Engineer Corps in 1880-87, and professor of mechanical engineering in the Agricultural and Mechanical College of Michigan in 1887-91. In 1891 he became professor of marine engineering in Cornell University, and in 1904 he went to Stanford University as professor of mechanical engineering. Besides contributions to engineering journals, he published *The Resistance and Propulsion of Ships* (1898).

DURANDANA, do͞o'rȧn-dä'nȧ, also Durandal, Durenda, Durindana. Roland's sword, which he broke in twain on the day of his death, lest it should fall into craven hands.

DURANDARTE, do͞o'rȧn-där'tȧ. A traditional Spanish hero, killed in the battle of Roncesvalles. He is mentioned in the old ballads, and appears in *Don Quixote.*

DURAND-CLAYE, dṳ'räɴ'klȧ', **Alfred Augustin** (1841-88). A French engineer. He was born in Paris, where he was chief engineer of the Department of Public Sanitation and professor of hydraulic agriculture at the Ecole Nationale des Ponts et Chaussées and at the Ecole des Beaux-Arts. He subsequently became inspector-general of roads and bridges. The following are his more important works: "Stabilité des voûtes en maçonnerie," in the *Annales des Ponts et Chaussées* (1867), a work which has been extensively introduced into engineering schools; *Stábilité des arcs métalliques* (ib., 1868); *Assainissement de Bruxelles* (ib., 1870); *Pompes centrifuges* (ib., 1873); *Lac Fucino* (ib., 1878); *Cours d'hydraulique agricole* (1890).

DURAN'DUS, Gulielmus (1237-96). A Roman Catholic prelate and jurist, surnamed The Speculator. He was born at Puimisson, near Béziers, and was educated at Bologna. After teaching canon law at Modena and occupying several important offices in the Papal service at Rome, he was appointed Bishop of Mende in Languedoc (1286), whence he was recalled to Italy in 1295 by Pope Boniface VIII., who appointed him Governor of Romagna. A splendid tomb was erected to his memory in the Dominican Church of Santa Maria sopra Minerva at Rome. The principal work of Durandus is the *Speculum Judiciale* (c.1271), a complete system of practical jurisprudence, comprising for the first time all the Roman and ecclesiastical laws. The work is based upon a careful study of the legislative texts, the jurisprudence, and the commentaries of previous investigators, and is valuable both from a theoretical and a practical point of view. More than forty editions of it have been published, the best being that of 1612. The liturgical work of Durandus, entitled *Rationale Divinorum Officiorum,* which aims at an explanation of the symbolical meaning of the Christian rites, is also widely known. As the

Speculum was basic in its influence upon the development of legal procedure, so the *Rationale* may be accepted as the standard work on the liturgy of the Roman Catholic Church. It was published at Mainz in 1459, and is one of the first specimens of the art of printing.

DURANGO, dōō-rän′gō (also known as Guadiana or Ciudad de Victoria). The capital of the State of Durango, Mexico, 480 miles north by west of Mexico City, on the Funal River and on the Mexican International Railway (Map: Mexico, F 5). It is situated nearly 7000 feet above sea-level, in a plain at the foot of the Cerro del Mercado, a mountain of iron. The city is an episcopal see, and contains a handsome cathedral. Other imposing buildings include the Government palace, city hall, theatre, hospital, and penitentiary. Until recently there was a mint, which dated from 1811, and coined annually gold and silver to the amount of about $1,000,000. There is a college, formerly controlled by the Jesuits. The city is lighted by electricity, and has street railways. Durango is in an agricultural and stock-raising district, and is an important mining centre; it has also cotton and woolen mills, flour-mills, sugar-cane mills, foundries, and a large tobacco-factory. It is the leading commercial city of the State. There are thermal and mineral springs in the vicinity. Durango was founded in 1563 by Alonzo de Pacheco. Its importance dates from the discovery of the valuable mines of Guarisamey. Population, in 1895, 26,428; in 1900, 31,092.

DURANGO. An inland State of Mexico, bounded on the north by Chihuahua, on the east and southeast by Coahuila and Zacatecas, and on the west and southwest by Sinaloa (Map: Mexico, G 5). Area, 42,276 square miles. The western portion is traversed by the rugged Sierra Madre Mountains. The eastern portion consists of an elevated plateau, arid and unproductive in the north; fertile, though lacking water, in the central district; while nearly 1000 square miles in the south consist of volcanic hills, known as La Breña. The principal rivers are the Nazas, the Mesquital, and the Rio de las Palmas. The cooling influence of snow on the mountains makes the climate generally healthful. The western slope is intensely hot during the greater part of the year. The raising of cattle and sheep is the principal industry; agricultural production is limited, being confined to wheat and vegetables in the more fertile eastern districts, and sugar-cane and cotton along the river valleys. The State is rich in minerals, principally silver, while large quantities of iron, gold, zinc, and lead are also obtained. The mines are managed chiefly by American capitalists. The Mexican International and the Central railways cross the State. The chief town is Durango, the capital (q.v.). Population, in 1895, 292,549; in 1900, 370,294, a large proportion being Indian.

DURANGO. A town and the county-seat of La Plata County, Colo., 452 miles by rail southwest of Denver, on the Las Animas River, and on the Denver and Rio Grande and the Rio Grande Southern railroads (Map: Colorado, B 4). It is the commercial centre for southwestern Colorado and northwestern New Mexico, a section devoted to mining, stock-raising, and agriculture. Durango has smelting and reduction works, flouring-mills, and extensive coal and coke interests. Pop., 1906 (local est.), 5200.

DURANT′. A city in the Choctaw Nation, Ind. Ter. (Oklahoma), 20 miles north by east of Denison, Tex., on the Missouri, Kansas, and Texas, and the Frisco System railroads (Map: Indian Territory, G 5). Among its institutions is a Presbyterian college. The chief industry is agriculture, cotton, corn, and berries being the principal products. Under a charter of 1904 its government is vested in a mayor and a unicameral council of six members. Pop., 1900, 2969.

DURANT, Henry Fowle (originally Henry Welles Smith) (1822-81). An American lawyer and philanthropist, born at Hanover, N. H. He graduated at Harvard in 1841, studied law, and subsequently built up a profitable practice in Boston. From 1864 to 1875 he was a lay preacher in Massachusetts and New Hampshire. He is best known, however, as the founder of Wellesley College (q.v.), to which he contributed between one and two millions of dollars.

DURANTE, dōō-rän′tȧ, Francesco (1684-1755). An Italian composer, one of the founders of the Neapolitan school of music. He was chapel-master in Naples, and in 1742 was at the head of the Conservatorio Santa Maria di Loreto in that city. He had great fame as a teacher. Among his pupils were Duni, Jommelli, Piccinni, Pergolesi, Sacchini, and Paisiello. Under Durante the Neapolitan school reached the climax of its celebrity, and it was in this school that the great traditions of Italian vocal art were established. As a composer he adhered to the severe style of the early Italian masters.

DURANTIS, dụ′räɴ′tēs′, Gulielmus. See Durandus, Gulielmus.

DURÃO, dōō-rouɴ′. José da Santa Ritta. See Santa Ritta Durão.

DURAS, dụ′rȧs′, Claire Lechat de Kersaint, Duchess of (1777-1828). A French novelist, whose *Ourika* (1823) and *Edouard* (1825) represent the best phase of the culture of the Restoration, and foreshadow the socialistic fiction of George Sand (q.v.).

DURATION (ML. *duratio*, from Lat. *durare*, to last), or Persistence in Time. The simplest temporal determination of mental processes. It may be assumed that every simple conscious process and every state of consciousness has a normal duration, varying with variation of circumstances, but still capable of numerical statement. The ascertainment of this normal duration is of importance to an exact psychology, and a good deal of work has accordingly been done upon it. Unfortunately, the complication of factors is so great, even in the most favorable case—that of sensation—that the results so far obtained must be taken with reserve. Suppose, e.g. that we try to determine the duration of pressure sensation by applying an intermittent stimulation at a chosen point of the cutaneous surface, and noting the rapidity at which the stimuli may follow each other without giving rise to a single continuous pressure. If we mark the point at which the stimuli are still just sufficiently separated to give a rough, thrilling perception, we shall say that the skin can discriminate pressures of $\frac{1}{500}$ of a second's duration and under. If, on the other hand, we demand that the pressure sensations be full and clear, we shall put their duration as high as $\frac{1}{20}$ or $\frac{1}{30}$ of a second. And these two values will vary, further, with the intensity of the applied stimuli. In the sphere of vision, the duration of sensation depends partly upon the intensity of stimulus, partly upon the character of the visual interval which separates the given sensations. Külpe estimates it, omitting the negative after-image (q.v.) at $\frac{1}{20}$ of a second. Temperature sensations last, on the average, about half a second. The times required for the cognition of tones vary considerably with practice. Maximal practice presupposed, they lie, apparently, between one and two vibrations, and thus decrease with increase of the pitch-number of the stimulus. Thus, a tone of 64 vibrations must be sounded for $\frac{1}{40}$ of a second, while a tone of 187 vibrations can be cognized in $\frac{1}{125}$ of a second. There is, however, a point upon the scale at which the duration of stimulus necessary to the cognition of a tonal quality sinks to an absolute minimum. This point lies at the G of 3168 vibrations in the second, which can be heard if the tone sound only for $\frac{63}{10000}$ of a second. (For the duration of a pulse or wave of attention, see ATTENTION.) No investigation of affective durations has as yet been undertaken.

Psychologists have also made a study of duration as such—i.e. of our capacity to perceive and to compare empty time-intervals. Thus, two electric sparks, seen in daylight, are clearly differentiated if the time between them amount to $\frac{1}{20}$ of a second; the snaps of two sparks are heard as separate, under favorable conditions, if the interval be as small as $\frac{1}{500}$ of a second. When the impressions belong to two different sense-departments (touch-hearing, touch-sight, sight-hearing), the just noticeable interval varies with the order in which they come (touch-hearing or hearing-touch), and with the direction of attention; the values most frequently obtained fall within the limits $\frac{1}{10}$ and $\frac{1}{50}$ of a second. It need hardly be said that the judgment in these cases is a judgment simply of the separateness of the two sensations, and that the attention is directed upon the stimuli themselves and not upon the length of the time-interval between them.

Our appreciation of the relative duration of short intervals—i.e. our judgment as to whether a given interval is longer or shorter than another—is somewhat astonishingly accurate. For psychological purposes, intervals fall into three groups: (1) 'Short' times, ranging from the just noticeable duration to about 0.5 or 0.6 of a second; (2) 'moderate' times, extending from this latter value to 3 or 4 seconds; and (3) 'large' times, from 4 seconds upward. In the case of (1) our temporal estimation is direct; the impressions which limit the intervals (sharp sounds) are all in consciousness together; we do not compare the intervals, but judge simply of the rapidity or rate of succession of the limiting stimuli. Our judgment is therefore strongly influenced by the quality, intensity, and duration of these limiting impressions, as well as by their rhythmical form, by the direction of attention, etc. With maximal practice and under favorable conditions, an interval of 0.3 second may be discriminated from an immediately following interval of 0.303 second. In the case of (2) and (3), the temporal estimation is indirect. Large times are judged predominantly in terms not of time, but of its contents: the greater the number of ideas, perceptions, or feelings in the interval, the longer is the interval estimated to be. Moderate times seem to furnish the material of true temporal comparison. The first limiting impression of the first interval is just disappearing from consciousness as the first impression of the second interval enters. The former impression is then reproduced; a definite direction is given to the strain of attention, and the closing impression of the second interval is 'expected' at a moment corresponding to that at which the first interval closed. The basis of judgment is thus given by strain and other organic sensations, with their accompanying feelings.

The work so far accomplished upon the course of temporal discrimination is incomplete, and the laws upon which it rests demand further confirmation. It appears, however, that there is constancy of the relative differential sensitivity (see DISCRIMINATION, SENSIBLE) over a certain range of short and moderate times; that short intervals are overestimated and longer intervals underestimated; and that this error of estimation has the zero value at an interval of 0.5 or 0.6 second (indifference point of temporal discrimination).

Consult: Külpe, *Outlines of Psychology* (London, 1895); Wundt, *Grundzüge der physiologischen Psychologie* (Leipzig, 1902-3); Meumann, in *Philosophische Studien*, viii. (Leipzig, 1893); Weyer, in *Philosophische Studien*, ix. (Leipzig, 1894); Titchener, *Exper. Psych.*, II., ii., 1905.

DURATION. In plants, the length of the vegetative period. One of the chief ecological classifications is based on the duration of the various plants or their organs. Perhaps the most important classification of this kind is that into monocyclic, dicyclic, and pleiocyclic plants; or, as they are more popularly called, annuals, biennials, and perennials. Whether or not these types may be regarded as the product of certain ecological conditions, it is certain that they are often associated with particular environments. Annuals and biennials, for example, are most common in new habitats, as in gardens allowed to run wild, and after fires, or in xerophytic situations, as on shores and deserts. Perennials, on the other hand, comprise most of the world's vegetation, and dominate particularly in habitats that are ecologically rich or that have been long established. It seems, therefore, that the perennial habit is, on the whole, the most successful, and it is not difficult to see why, since perennials commonly spread vegetatively as well as by seed. Each year, therefore, the perennials are on the ground at the beginning of the season, while annuals and biennials are obliged to start from seed. A garden patch allowed to run wild shows, as a consequence, fewer and fewer annuals and more and more perennials each year until finally the annuals are gone. In desert regions and along shores the vegetation is sparse, and annuals or biennials may exist almost indefinitely. Annuals are scarce in Alpine and Arctic regions, perhaps because the vegetation periods are too short for their development.

Another important classification based on duration is that into deciduous and evergreen forms;

in these plants, however, the critical point is not fully expressed when these terms are employed. Deciduous forms may be defined as plants which shed their organs, and especially leaves, regularly; whereas evergreens are those plants which shed their leaves irregularly. Evergreen leaves are much longer lived than deciduous leaves. The significance of these types will be discussed under the head of FOREST (q.v.). The duration of stems depends largely on their structural nature; in temperate climates most aërial herbaceous stems are annual, whereas woody stems are perennial. Flowers, in contrast to other organs, have an ephemeral duration. There seems thus to be a harmonious relation between duration and structure, organs with long life having resistant structures, while short-lived organs are commonly delicate. See FOREST; STEM; VEGETATIVE PROPAGATION; BIENNIAL; ANNUAL; PERENNIAL.

DURAZZO, dōō-răt′sō (Turk. *Durts*, Slav. *Dratch*, Albanian *Duressi*, from Lat. *Dyrrhachium*, from Gk. *Δυῤῥάχιον*, from *δυσ-*, *dys-*, bad + *ῥηγνύναι*, *rhēgnynai*, to break, in allusion to the surf on the peninsula). A decayed maritime town of European Turkey, in the Vilayet of Scutari (Albania), built on the rocky peninsula of Pelu, in the Adriatic, about 55 miles south of Scutari (Map: Turkey in Europe, B 4). It is surrounded by dilapidated old walls. The town has been the seat of a Catholic archbishop since the days of Justinian. The harbor has been silted up. Durazzo exports to Austria-Hungary wool, raw silk, and some grain. Population, about 1200.

Durazzo is the ancient Epidamnus, which was founded in B.C. 625 by a band of Corcyræans and Corinthians. Epidamnus became a great and populous city, but was much harassed by internal party strifes, the banishment of its aristocratic element in B.C. 436, and the consequent dispute regarding authority between Corcyra and Corinth being one of the causes which led up to the Peloponnesian War. It passed to the Romans in B.C. 229, and its name was changed to Dyrrhachium. It later became the seat of a Roman colony, and an important landing-place for those sailing from Brundusium, in Italy, to Greece. Dyrrhachium was the starting-point of the Via Egnatia, leading to Byzantium. Here Pompey was for some time beleaguered by Cæsar. About the end of the fourth century it became the capital of the Byzantine Eparchy of New Epirus. The town was taken by the Ostrogoths, Bulgarians, and Normans, and in the latter part of the Middle Ages belonged successively to the House of Anjou (then ruling in Naples) and to Venice, from whom it was wrested by the Turks in 1501.

DURBAN, dẽr′băn. The only seaport of Natal, and the fourth seaport in importance in British South Africa (Map: Cape Colony, O 6). It is situated in about latitude 30° S. and longitude 31° E., at the head of the landlocked Bay of Natal, the southern end of which is marked by the fortified "Bluff" and its lighthouse. Durban's public buildings include a town hall, a museum, a library, and a theatre; and it has street railways. The centre of the town is occupied by the public gardens; there are also botanical gardens, two parks and a race-course. Water is brought from a river 15 miles distant. The climate, although exceedingly hot during one or two months in the summer, is on the whole not unhealthful. The harbor, greatly improved by extensive modern works, is well protected, and sufficiently deep for vessels of heavy draught. The annual shipping of the port amounts to over 2,000,000 tons, and the total value of the commerce (mostly imports) is over $70,000,000 per annum. Besides its good harbor, Durban derives much importance on account of its position as the terminus of two railway lines leading into the Orange River and Transvaal colonies. The population of the town increased from 4991 in 1886 to 36,014 in 1891 and 69,903 (32,926 Europeans, 15,857 Asiatics, and the rest natives) in 1904. Durban was founded by the Dutch in 1823, and received its present name from Sir James D'Urban. Consult Ingram, *Story of an African Seaport: History of the Port and Borough of Durban* (London, 1900).

DURBAR, dẽr′bär (Pers. *darbār*, audience). A Hindustani word signifying a court or place of judgment, in which are decided, or from which are promulgated, affairs of importance to the State or tribe. It is customary throughout India, Afghanistan, and parts of Persia, for rulers, governors, or chiefs to give audience to distinguished visitors in 'durbar,' as well as to ratify treaties or make important agreements. The British Viceroy and all other British governors in India follow the native custom, in accordance with which Queen Victoria was proclaimed Empress at a magnificent durbar held on the ridge at Delhi in 1877, and King Edward VII. as Emperor in 1902. The term 'durbar' is also applied to the room or place of audience.

DURBIN, dẽr′bĭn, JOHN PRICE (1800-76). An American clergyman, born in Bourbon County, Ky. At an early age he entered the Methodist ministry, but while preaching pursued a course of study, and in 1825 graduated at Cincinnati College. He was chaplain to the United States Senate in 1831, was editor of the *Christian Advocate and Journal* in 1833, and in 1834 became president of Dickinson College. From 1850 to 1872 he was secretary of the Missionary Society, which owes much of its success to his exertions. He published *Observations in Europe, Principally in France and Great Britain* (1844), and a similar work on Palestine, Syria, and Egypt (1845). Consult Roche, *Life of John P. Durbin* (New York, 1879).

DUR′DEN, DAME. The name of a conscientious housewife in a well-known old English ballad, and hence applied as an affectionate nickname to Esther Summerson in Dickens's *Bleak House*.

DÜREN, dṳ′ren. An ancient town of Rhenish Prussia, situated on the Roer, 18 miles east of Aix-la-Chapelle (Map: Prussia, B 3). Düren has manufactures of woolen cloths, iron and steel ware, paper, soap, leather, oil, sugar, and needles. Its Gothic Church of Saint Anna, containing relics of the saint, attracts many pilgrims. The town hall has a fine assembly room. There are also at Düren a number of collections of antiquities and a municipal library. Population, in 1890, 21,721; in 1900, 27,171; in 1905, 29,770. Here Charlemagne, on his way to attack the Saxons, held diets in A.D. 775 and 779.

DÜRER, dṳ′rẽr, ALBRECHT (1471-1528). A German painter, engraver, and designer of the Franconian school, the greatest master, all things considered, of the German Renaissance. He was born at Nuremberg, May 21, 1471, the third of a family of eighteen children. His father, a goldsmith, was of Hungarian descent, and had come to Nuremberg in 1455. The lad worked with his father at the goldsmith's trade, and his early talent for design is shown in a clever drawing of himself at the age of thirteen, in the Albertina Collection, Vienna, and in a pen drawing of the "Madonna with Two Angels" (1485) in the Museum of Berlin. He was apprenticed in 1486 to the painter Wohlgemuth, and studied with him three and a half years. In 1490 he entered upon his travels, visiting various German towns, among which were Colmar and Basel, and probably also visiting Venice. In 1494 he returned to Nuremberg and married Agnes Frey, the beautiful daughter of a cultured merchant. She was probably a good wife, and not the Xantippe she was reputed to be, thanks to the pique of Dürer's friend Pirkheimer. In 1497 Dürer opened a studio of his own at Nuremberg, and figured henceforth as an independent master.

The work executed up to the time of his visit to Venice, in 1505, belongs to his first period. His early engravings and drawings show the influence of Mantegna, and also that he probably had some opportunity of studying the antique. He was also influenced by Jacopo dei Barbari, a Venetian artist then residing in Nuremberg, who taught him anatomy and ideal proportions. His religious subjects were chiefly altar-pieces, designed by himself, but mostly executed by his pupils, according to the custom of German painters of the day. The earliest is in the Dresden Gallery, and represents the "Virgin Adoring the Sleeping Christ-Child." Another, the Baumgarten altar (Munich), portrays the "Nativity," and the figures of the 'donors' in knightly armor. Both of these are, for the most part, by Dürer himself. The best of these religious subjects of the first period is the "Adoration of the Magi," painted in 1504 for Frederick the Wise, Elector of Saxony, but now in the Uffizi Gallery at Florence. It is well composed, and enriched by charming landscape, with good perspective. The Virgin is fair-haired and German, and the kings are dignified and well-modeled figures, with fine heads.

The portraits of this period were executed without the assistance of his pupils, and are distinguished for strength and character. There are two interesting portraits of Dürer's father—one in the Uffizi, executed before his "Wanderjahre," in 1490, and the other at Sion House, London, done in 1497. Among the very best of his portraits are two of himself. That of 1498, of which the original is in Madrid (the Florence example being a copy of a replica), shows a youth of noble features, with long fair hair, and the fine figure for which he was celebrated. In the more mature, full-face portrait of 1500 (Munich), the beautiful ringlets are even more luxuriant, and the head is Christ-like in its refinement and dignity. Among his other portraits of this period are two of "Katharine Fürleger" (Frankfort), of Hans Tucher and his wife (1499, Weimar), of Oswald Krell (1499, Munich), and of Frederick the Wise (Berlin).

The Venetian journey of 1505 caused a change in Dürer's art. Before this time his work was angular and stiff, like that of the German school. The study of the antique and of the works of Venetian masters refined his sense of form and gave him a larger view of art; but he never lost a jot of his individuality, remaining thoroughly realist and German. He was especially influenced by Giovanni Bellini, whom he considered the greatest of painters, and who proved a good friend. The other Venetian painters viewed him with curiosity and envy, but the nobility honored him, and before he left Venice the Venetian Council offered him an annual pension of 200 ducats to remain. He also visited Bologna and Ferrara, and was on his way to Padua to see Mantegna, whom he much honored, but turned back on news of the death of that master, arriving at Nuremberg late in 1507.

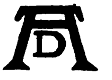
Modern research has shown that the real cause of Dürer's visit to Venice was a commission from the German merchants of Venice to paint a large altar-piece for their chapel in San Bartolommeo. This picture, long in Strahow Abbey, Prague, is now in the Rudolphinum of that city. It has been much damaged by restoration; but even now we can see that it must have been wonderful in composition and color. Its subject is the "Festival of the Rosary," and it represents the Virgin and the Christ-Child giving wreaths of roses to the Emperor Maximilian and to Pope Julius II., while Saint Dominic and angels do the like to the bystanders. His "Christ Disputing with the Doctors" (1506), now in the Barberini Palace, Rome, was executed, as the inscription records, in the space of five days, and shows Dürer's facility and skill with the brush. Among his other religious subjects are the "Martyrdom of the Ten Thousand" (1508), ordered by Frederick the Wise, now in the Vienna Museum of Fine Arts, and the Heller altar-piece, of which the original was destroyed. The "Adoration of the Trinity' (1511), in the Museum of Vienna, is the best-preserved of Dürer's pictures, as well in coloring as in sentiment.

Among his other works of the second period are a small but exquisite "Christ on the Cross" (1506, Dresden), exquisite in execution and sentiment, and a "Madonna with the Pear" (1512, Munich). His "Adam and Eve" (1507), in Madrid (the Florentine examples being copies or replicas), show what he learned in Italy as to treatment of the nude. It is somewhat idealized, not a copy of the model, as was customary in Germany. His heads of "Saints James and Philip" (1516, Uffizi) are of great strength, and his "Lucretia" (1518, Munich), a fine nude, is one of his few mythological subjects. Among his portraits are two fine examples of unknown young men, at Vienna and at Hampton Court. His well-known portrait of Charles the Great, with crown and sceptre, and that of the Emperor Sigismund (both in the Germanic Museum, Nuremberg), date from 1510.

In the summer of 1520 Dürer, accompanied by his wife and servant, made a journey to the Netherlands which lasted over a year. His object was to meet the new Emperor, Charles V., when he landed at Antwerp, in order to obtain a renewal of the pension which he had enjoyed under Maximilian. He has left us an interesting journal of his journey, and he also kept a sketchbook, many of the leaves of which survive. He was received with great honor all along his journey, especially by the painters of Flanders, who at Bruges, Ghent, and Antwerp gave him festivals. Margaret of Parma, Regent of the Netherlands, received him with honor, and he painted a portrait of the King of Denmark. He was present at the Emperor's coronation at Aix-la-Chapelle, where his pension was renewed. He was much impressed with the art of the Netherlands, especially with that of the Van Eycks in the Ghent altar, and as a result he became more naturalistic than ever. The works produced after his return to Nuremberg belong to his third and greatest period of painting.

The year 1526 is remarkable for the completion of a number of Dürer's best paintings. First to be mentioned are his "Four Apostles" (sometimes called the "Four Temperaments"), composed of two panels of life-size figures of the Apostles John, Peter, Mark, and Paul. They were executed at a time when the use of religious images was coming under the ban of the Reformation. For years they remained in the council chamber of Nuremberg, but are now in the Munich Gallery. They are Dürer's greatest paintings, and never did a painter's art produce stronger and more individual representations. The heads of the Apostles are dignified and sublime, the drapery is simple and majestic, and although the details are executed with great care, they do not detract from the general effect. The coloring is faultless, especially in the white and red robes of John. The same year he completed his best portrait—that of Hieronymus Holzschuher. The head is of wonderful strength and character, and the difficult color scheme is skillfully handled; the hair is perfectly white, while the eyes are blue and the face is ruddy and the background green. In the same year he completed the portraits of the two other aldermen of Nuremberg—Jakob Muffel (Berlin) and Johannes Kleeberger (Munich). The fine portrait of Hans Imhof (Madrid), a third Nuremberg councilor, dates from 1521.

Dürer passed the latter part of his life in affluence, and was held in high honor by his townsmen, as much for his character as for his art. "His least merit was his art," said Melanchthon. His most intimate friend was Willibald Pirkheimer, the Nuremberg merchant and humanist; he also enjoyed the friendship of Erasmus, Luther, and Melanchthon, and was highly thought of by Frederick the Wise and the Emperor Maximilian, who allowed him an annual pension of 100 gulden. In 1518 he began his portrait of the Emperor at the Diet of Augsburg, finished in 1519, and now in Vienna. In 1516 he carried on his famous correspondence with Raphael, who sent him drawings in return for a crayon portrait of himself. He died at Nuremberg on April 15, 1528, of consumption, contracted in the Netherlands. He was buried in the Churchyard of Saint John. A fine monument by Rauch was erected to him in the Fischmarkt, where his house still stands.

Most of Dürer's works are signed with his quaint monogram  and are dated. His coloring varies much in excellence, being sometimes bright and harmonious, at others hard and dry. He inherited the angularity of form of the German school, as may be especially seen in his draperies; but this was much softened by Italian influence. He paid much attention to detail, and his German exactness often detracts from the effect of the whole. His composition is sometimes awkward and crowded. But in his best work he avoided these errors, and his drawing was always excellent. The finest collection of his drawings is in the Albertina, Vienna, which has above a hundred. Next to this is the British Museum, and after that Berlin. His drawings were all finished with care and exactness, and they were executed on various materials, with the pen, pencil, and brush. Sometimes they were outlined in water-colors, sometimes studies on paper and parchment in body-color. In the Augsburg Gallery there is a life-size Madonna in body-colors; other famous examples are the "Lions" (Hamburg), the "Jay's Wing" (Berlin), and the "Hare" (Albertina). He also painted a few water-color landscapes, which show fine observation and technical ability; a noted example is the "Mill" (Berlin). Among his tinted drawings are "Women Bathing" (Bremen), and "Venus with Cupid Stung by Bees" (British Museum). His famous "Green Passion" (Albertina), a series of pen and brush drawings on green paper, ranks with his best engravings. Among his best pen and ink drawings are the "Adoration of the Kings" (Albertina), and especially the "Prayer-Book of the Emperor Maximilian" (Munich Library), in which he decorated the borders of forty-five pages with drawings in red, green, and violet ink.

Dürer was best known to contemporaries as an engraver, and in this art he ranks even higher than as a painter. He was easily the most prominent engraver of his day, and one of the very greatest of all times. In this art his imagination, his facility and dramatic action have full play. Before his day wood-cuts were mere outlines, and copper plates consisted of dark figures on light backgrounds. Dürer introduced light and shade into engraving, giving it tone and thus making it pictorial. He designed over a hundred wood-cuts, four great series, besides many single plates. The "Apocalypse" series (16 pages, published 1498) shows his mastery of the art, and an extraordinary fantasy in making tangible the mystic visions of Saint John. The fourth plate, representing the "Four Riders of the Apocalypse," is especially good. His "Large Passion," a series of twelve plates, was produced for the most part in 1500, though published in 1511. His "Life of the Virgin," a charming series of sixteen plates, was executed chiefly in 1504-05 and published in 1511. The "Little Passion" is a series of thirty-seven plates, executed in his best period (1509-10). We can but wonder at the invention displayed in the different versions of the same event, as compared with the "Large Passion." The "Triumphal Arch of Maximilian," executed after 1512, was a series of ninety plates so engraved as to form a triumphal arch ten feet high. The subjects of the different plates were laudatory of the Emperor, and of these twenty-four were by Dürer, including the chief subject, the "Triumphal Car," containing the Emperor and his family.

In line engraving Dürer is equally renowned. His first works are executed in the manner of Schongauer and Mantegna—dark figures on a light background. Another interesting group of his copper plates is identical, except that the figures are reversed and better executed, with those of another engraver, whose signature was 'W,' probably Wohlgemuth. It is uncertain whether the original design was by Dürer or not. Among the best engravings of this group are the "Knight and Lady," the "Madonna with the Monkey," the "Dream," the "Four Witches." He soon progressed to a better manner, using a dark background. Among the prints of this description are the famous "Adam and Eve" (1504); "Christmas;" "Family of Satyrs" (1505); and the "Little Passion" (16 plates, 1512-13). Afterwards he attempted etchings, but not with equal success. He presently combined both methods, first etching the plates and then going over them with the graver. These are the very best copper engravings he ever did, and in their beautiful silver tones they display the perfection of pictorial charm in an engraving. Among the best are the "Virgin Crowned by Angels," the "Virgin with the Child," and the well-known "Saint Jerome in his Study," the weird "Death and the Knight" (1513), and the strange "Melancholia" (1514). He also engraved the portraits of celebrated contemporaries, such as the larger and smaller portraits of Cardinal Albrecht of Brandenburg, Frederick the Wise, Pirkheimer, Melanchthon, and Erasmus. Many of his engravings abound in a delightful humor, like the "Three Peasants," "Love Offers," and others mentioned above, which are regarded by some as the foundation of *genre* in modern art.

Dürer also occupied himself with sculpture and architecture, but none of the sculptures bearing his monogram are unquestionably genuine. The last years of his life were spent largely in literary activity. His original and advanced ideas on fortifications are given in a work on *The Fortification of City, Castle, and Market Town* (Nuremberg, 1527; new ed., Berlin, 1823). His remaining works were on subjects interesting to the painter: *Instruction in Measuring with the Compass* (1525); and *Four Books of Human Proportion* (1528).

BIBLIOGRAPHY. The literature upon Dürer is very compendious. The chief sources for his life are his own journal and letters, of which the best edition is that of Moritz Thausing, *Dürer's Briefe, Tagebücher und Reime* (Leipzig, 1872). The most important work on Dürer is Thausing, *Dürer, Geschichte seines Lebens und seiner Kunst* (2d ed., Leipzig, 1884), trans. of 1st ed. by Eaton (London, 1882). Springer, *Albrecht Dürer* (Berlin, 1892), is also important. His drawings are well treated by Charles Ephrussi, *Albrecht Dürer et ses desseins* (Paris, 1882); his engravings by Sidney Colvin, *Albrecht Dürer, His Teachers, His Rivals, and His Scholars* (London, 1877). Other German monographs on Dürer are by Eye (Wandsbek, 1892), Kaufmann (Freiburg, 1887), Weber (Ratisbon, 1894), Knackfuss (6th ed., Bielefeld, 1899). Popular monographs in English are: Scott (London, 1872), Heaton (London, 1881), Cust (London, 1897). Consult also: Zahn, *Dürer's Kunstlehre und sein Verhältnis zur Renaissance* (Leipzig, 1866); Retberg, *Nürnberg's Kunstleben* (Stuttgart, 1854); id., *Dürer's Kupferstiche und Holzschnitte* (Munich, 1871); Schmidt, in Dohme, *Kunst und Künstler Deutschlands und der Niederlande* (Leipzig, 1877), English trans. by Keane (London, 1880).

DURESS (OF. *durece, duresce, duresse*, It. *durezza*, from Lat. *duritia*, severity, from *durus*, hard). That degree and kind of coercion, exercised over a person's will, which entitles him to avoid any contract, deed, or transfer of property made during its continuance, or which excuses his criminal acts.

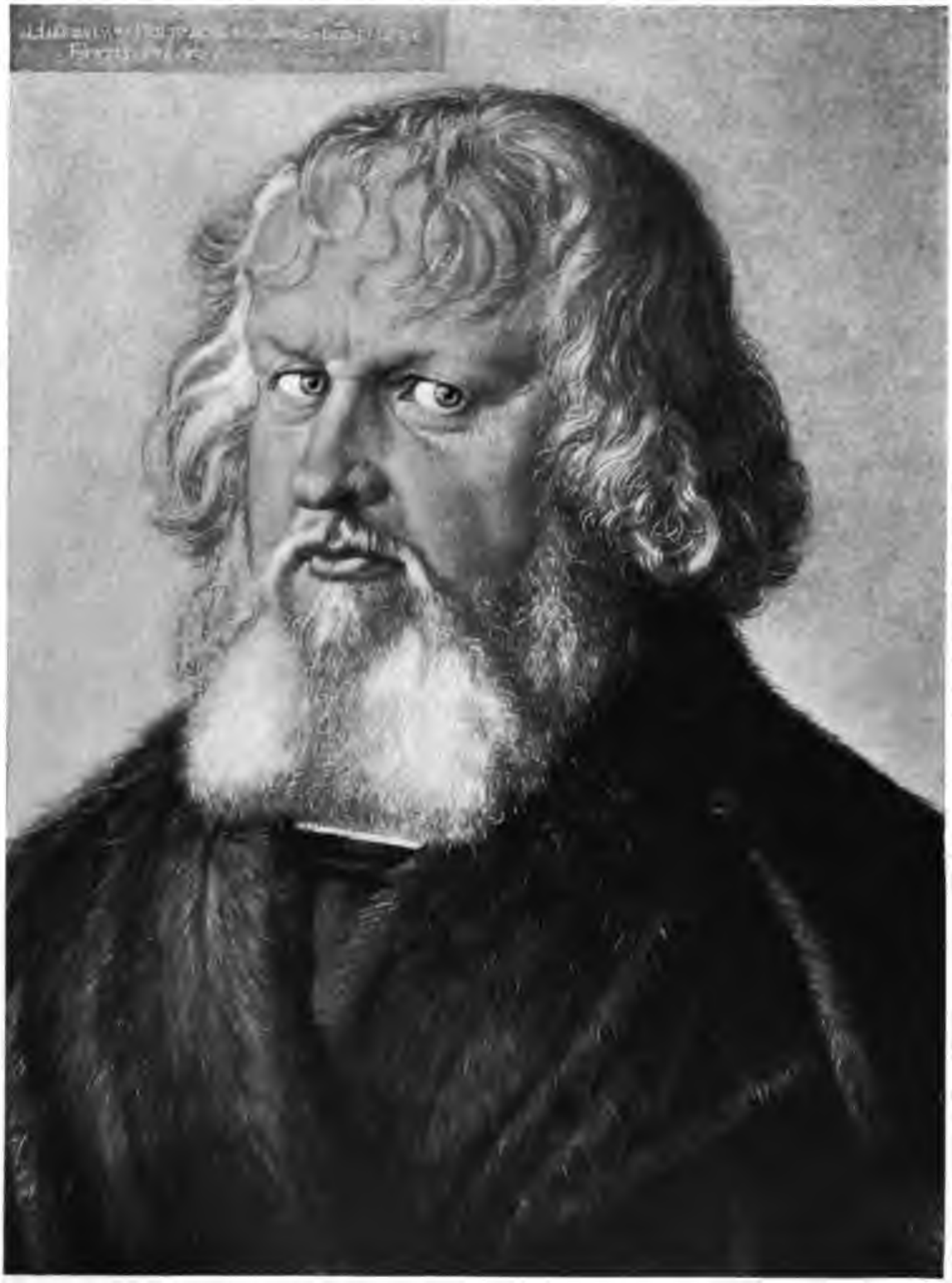
As an excuse for crime, duress is narrowly limited by the common law. The victim of the coercion must show that he was driven to commit the act by threats of personal violence to him which induced a well-grounded apprehension of present death or grievous bodily harm. Even such threats would not excuse his killing an innocent person, for the view of the law was that he ought rather to die himself than escape by the murder of an innocent man. He would be justified, however, in killing his coercer. Modern statutes in some of the United States declare such extreme duress an excuse even for homicide (q.v.).

In civil matters, also, the common-law doctrine of duress is confined within rather narrow limits. Not every form of constraint, unfairly imposed by one party to a contract upon the other, will enable the victim to avoid the contract. Only actual or threatened violence or imprisonment amounts to common-law duress. Moreover, it must be exercised upon the person who makes the contract, or upon the husband, wife, parent, or child of such person; and it must be exercised or instigated or adopted by the one to be benefited by the contract. Still again, the threats must be of grievous bodily harm and so made as to terrorize a man of ordinary nerve and courage; or they must be of unlawful imprisonment.

The doctrine has been somewhat extended in this country. According to the prevailing view, a person is under duress who is threatened with lawful imprisonment, provided the threat is made to overcome his will, and does overcome it, and is such as would naturally overcome the will of an ordinary man. A contract made by him in such circumstances does not have his free and true consent. It is imposed upon him by the threatener, and is voidable.

A threat to detain or even to destroy property cannot operate as duress according to the narrow view of the ancient common law. In some of our States, however, duress of goods is recognized, and an owner who promises to pay illegal exactions in order to obtain possession of his property is allowed to avoid the promise. Even where the old common-law doctrine prevails, the owner who has paid such exactions may recover the money on the ground that the defendant had received money which belonged to the plaintiff. There must, however, be actual constraint to justify a recovery in such a case. Payment of an illegal claim 'under protest' is a voluntary payment and will stand, unless it was enforced by actual detainer of property or person, or imminent danger thereof. See QUASI-CONTRACT. See also UNDUE INFLUENCE; CONSENT; and consult the authorities referred to under CONTRACT.

DURET, dụ'rȧ', FRANCISQUE JOSEPH (1804-65). A French sculptor, son of François Joseph Duret (1732-1816), of whom he was a pupil. Young Duret won the Prix de Rome in 1823. In 1833 he exhibited his "Neapolitan Fisher Dancing the Tarantella," a spirited statue in bronze, which established his reputation. In the same



ALBERT DÜRER

PORTRAIT OF "HIERONYMUS HOLZSCHUHER," FROM THE PAINTING IN THE NATIONAL GALLERY, BERLIN

class is his "Neapolitan Improvisatore" (1839). His works executed for public buildings include: "France Protecting Her Children" (1855), a group in the grand style for the new Louvre; two bronze figures for the tomb of Napoleon in the Invalides; a colossal Christ in the Church of the Madeleine; the statues of "Comedy" and "Tragedy" for the Théâtre Français; marble statues of Dunois, Philippe of France, Châteaubriand, and Richelieu at Versailles; and the group for the fountain of Saint Michel, representing that saint wrestling with Satan. He received the medal of honor in 1855, and was made a member of the Institute in 1843. As professor of the Ecole des Beaux-Arts he was more influential through his teaching than through his works.

D'URFÉ, dụr'fâ', Honoré. See Urfé, Honoré d'.

DURFEE, dẽr'fē, Job (1790-1847). An American jurist. He was born at Tiverton, R. I.; graduated at Brown University in 1813, and was admitted to the bar. In 1814-19 and 1827-29 he was a member of the State Legislature, from 1821 to 1825 he was in the National House of Representatives as a Federalist, and in 1835 he became Chief Justice of the Supreme Court of Rhode Island. He was the author of *What Cheer?* (1832), a poem in nine cantos; of an oration, *The Influences of Scientific Discovery and Invention on Social and Political Progress, or Roger Williams in Exile* (1843), under the pseudonym 'Theaptes,' and of a philosophical work in verse, entitled *The Panidea* (1846). Consult: *Complete Works of Job Durfee, with a Memoir of His Life* (Providence, 1849), edited by his son; also Gibson, *Discourse on the Character and Writings of Chief Justice Durfee* (Providence, 1848).

D'UR'FEY, Thomas (known as Tom Durfey) (1653-1723). An English poet and dramatist, born at Exeter (Devon). He turned from the law to become playwright, and made his first appearance with *The Siege of Memphis* (1676). He was far more successful with his comedies, of which he wrote a considerable number. His popularity was greatly furthered by the songs written by him for his plays and set to music by Purcell and others. Soon he was called upon to compose occasional verse, much of it in glorification of the triumphs of English arms. By Charles II., James II., William and Mary, and Anne, he was shown marked tokens of favor. Latterly, it appears, he became reduced to poverty, and his friends, Addison and Steele, obtained for him a benefit performance of his *Plotting Sisters* at Drury Lane. He was a mirthful fellow, who, as Addison says, "made the world merry," turned out song after song with slight effort, and himself sang them with good spirit and applause. His songs, with music, appeared in 1683-85, and in 1720 in the collection *Wit and Mirth*. He wrote further *Tales, Moral and Comical* (1706). His dramatic works were published contemporaneously, but have never been collected.

DURGĀ', dōōr-gä' (Skt., impassable). In Hindu mythology, one of the names by which the consort of the god Siva is known. This is her title when she appears in her fear-inspiring form. Similar is her awful manifestation as Kālī 'Black,' a dreadful goddess. Her image is often seen in Hindu temples. In her more pleasing aspect she is the same as Umâ, Pārvatī (q.v.). Consult: Dowson, *Hindu Mythology* (London, 1879); Wilkins, *Hindu Mythology* (2d ed., London, 1902).

DURHAM, dûr'*a*m. A maritime county of the northeast of England, between the Tyne and Tees, bounded north by Northumberland, east by the North Sea, south by Yorkshire, west by Cumberland and Westmoreland (Map: England, E 2). It has 32 miles of coast, generally low, but with some cliffs, and an area of 1001 square miles, five-sevenths being arable. Durham is one of the chief counties in England for the production and export of coal, and also for the mining of lead. Manufactures are numerous, including chemicals, glass, iron, earthenware, sails, ropes, and anchors. Ship-building is an important industry. The agricultural products are oats, barley, wheat, turnips, beans, and peas. The Teeswater breed of short-horned cattle is well known, and excellent draught and saddle horses are raised. Population, in 1891, 720,793; in 1901, 834,246.

Previous to the Roman invasion, Durham was in the possession of the Brigantes, and under Roman rule became part of the Province Maxima Cæsariensis. When the Anglo-Saxons gained control, it became part of Bernicia, and hence of the Kingdom of Northumbria, until the Norman Conquest. Under the Normans it obtained the privileges of a county palatine, and for many years its affairs were administered by the bishops, who enjoyed larger temporal prerogatives than in most of the other counties. In 1536 Henry VIII. stripped them of many of their juridical powers, but it was not until 1836, after the death of Bishop van Mildert, that an act of Parliament removed all temporal jurisdiction and privileges forever from the bishopric.

DURHAM (AS. *Dūnholm*, hill-isle, from *dūn*, hill, down + *holm*, island). A Parliamentary and municipal borough and ancient episcopal city of England, the capital of the county of Durham, 60 miles north-northwest of York. It is built around a steep rocky hill 86 feet high, nearly encircled by the Wear, which is here crossed by three bridges (Map: England, E 2). On the top of the hill are the cathedral and castle. Ancient walls partly inclose the hill, from which fine views are obtained of the fertile wooded country and of the suburbs across the river. On the site of a church dating from 995, Bishop William de Carilepho, about 1093, began the present magnificent cathedral, one of the finest Norman churches in England, to which additions continued to be made till about 1500. It thus exhibits the gradual changes of style between these periods. It is 507 feet by 200 feet, with a central tower 214 feet high, and two west towers 138 feet high. It contains the tombs of Saint Cuthbert (q.v.) and the Venerable Bede. Among the chief buildings connected with the former monastery are the dormitory, now used as the new library, a magnificent hall in practically its original condition, and the refectory, now the old library. The castle, formerly the residence of the bishops of Durham, but now the seat of the University of Durham, was founded about 1072 by William the Conqueror. It was built in the Romanesque style, but it has since been much altered. The present University of Durham was opened for students in 1833. A royal charter in 1837 empowered the university to bestow degrees. It has two colleges—University College and Bishop Hatfield's Hall. The corporation maintains markets and public baths. Durham has long been famous for its mustard. The town sends one member to Parliament. Population, in 1891, 14,900; in 1901, 14,650. Durham arose about the year 995, when Bishop Aldune brought here Saint Cuthbert's bones from Ripon and built a church to enshrine them. It became the seat of the Bishop and Count Palatine of Durham County. Consult: *Bygone Durham*, edited by Andrews (London, 1898); Low, *Durham* (London, 1897); Bygate, *Durham Cathedral* (London, 1899).

DURHAM. A city and county-seat of Durham County, N. C., 26 miles northwest of Raleigh, on the Southern, the Norfolk and Western, the Seaboard Air Line, and the Durham and Southern and other railroads (Map: North Carolina, D 1). It is an important manufacturing centre for tobacco, cigars, and cigarettes, having one of the largest granulated smoking-tobacco factories in the world. There are also cotton-mills, sash and blind factories, foundries, a fertilizer-factory, and other industries. Trinity College (Methodist Episcopal, South), opened in 1851, is located here. The city has also a school of fine art and a conservatory of music, a public library, and Watts Hospital. The government is administered under a charter of 1899 which provides for a mayor, chosen every two years, and a city council, elected on a general ticket. Settled about 1855, Durham was incorporated in 1869 with a population of 200. Near here General Johnston, with the Confederate army, surrendered to General Sherman on April 26, 1865. Pop., 1900, 6679; 1906 (suburbs annexed), 25,000.

DURHAM, JOHN GEORGE LAMBTON, first Earl of (1792-1840). An English statesman, born in London. After an education at Eton, he held a commission in the army for a short period. At twenty-one years of age he made a runaway marriage at Gretna Green with Harriet Cholmondeley, who died three years after. He married Lady Louisa Elizabeth Grey, daughter of Earl Grey, eighteen months later, and by this union strengthened his political position. In 1813 he entered Parliament for Durham as an advanced Liberal. In 1828 he was created Baron Durham of the city of Durham. He was one of the four persons who prepared the Reform Bill and supported it in the House of Lords. In 1833 he was appointed ambassador extraordinary to Russia. After a second mission to Russia he was appointed in 1838 Governor-General of Canada, where a formidable rebellion had broken out. In his efforts to suppress the insurrection, he exceeded the powers conferred upon him, and Lord Brougham, with whom he had differences, took advantage of the situation to interpellate his conduct in the House of Lords. Incensed at a vote of disapproval, Durham returned to England without being recalled or obtaining the royal consent. The important report on Canadian affairs prepared under his direction by his secretary, Charles Buller, advocated liberal changes in colonial policy which were adopted by his successors. He died at Cowes, Isle of Wight, in 1840.

DURHAM BOOK, THE. An edition of the Gospels, with Northumbrian-Saxon glosses, the work of Saint Cuthbert, the sixth Bishop of Durham.

DURHAM CATTLE. See CATTLE.

DURHAM LETTER, THE. A letter of Lord John Russell to the Bishop of Durham in 1850, protesting against the invasion of Catholicism in the United Kingdom, and especially in the Established Church itself. It resulted in the passage of a bill, which, however, was not enforced, against the establishment of a Roman Catholic hierarchy in England.

DU'RIAN (Malay *duryon*), or **DU'RION** (*Durio zibethinus*). A fruit-tree of the Malayan Archipelago, of the natural order Malvaceæ. It is a lofty tree, with leaves resembling those of the cherry, and with large bunches of pale-yellow flowers. The fruit is of the size of a large cocoanut; roundish oblong, with a hard thick rind, covered with soft spines, so that it somewhat resembles a hedgehog rolled up. The pulp of the fruit is of creamy consistency and delicious taste, but has a smell which is very repulsive until a taste for the fruit is acquired. Persons accustomed to it, however, universally regard the durian as one of the very finest fruits of the East. In the Indian markets it commands a higher price than any other native fruit. It contains ten or twelve seeds as large as pigeons' eggs, which, when roasted, are not inferior to chestnuts. One tree yields about 200 fruits in a year. For illustration, see Plate of DAHLIAS, ETC.

DU'RIE, or **DURY,** JOHN (1596-1680). A Scotch Protestant advocate of Church unity. He was born in Edinburgh; his education was received at Sedan and Leyden, and most of his life was passed on the Continent. At home he held the position of chaplain to Charles I. and Mary, Princess of Orange, and was a member of the Westminster Assembly. His reputation rests upon his indefatigable, though fruitless, efforts to unite the Lutheran and Reformed, the Presbyterian and Congregational churches, an object for which he pleaded in every place to which his extensive travels brought him, and with every prominent person he met. He died at Cassel, Germany, September 26, 1680.

DÜRING, dụ'rĭng, AUGUSTE. See CRELLINGER, AUGUSTE DÜRING.

DÜRINGSFELD, dụ'rĭngs-fĕlt, IDA VON (1815-76). A German author, born at Militsch, Lower Silesia. She was the daughter of an army officer, and was a diligent student of languages, devoting herself particularly to Italian and Bohemian folk-lore. She published a volume of poems entitled *Gedichte von Thekla* (1835; 2d vol. entitled *Für Dich*, 1850, 2d ed., 1865). Her other productions include: *Schloss Goczyn*, a novel (2d ed., 1845); *Magdalene*, a novel (1844); *Skizzen aus der vornehmen Welt* (1842-45); *Margareta von Valois*, a historical novel (1847); *Böhmische Rosen*, a collection of Bohemian folksongs (1851); *Lieder aus Toscana*, Tuscan folksongs (2d ed., 1859); *Buch denkwürdiger Frauen* (5th ed., 1896). Several ethnographical works were written by her in collaboration with her husband, who committed suicide on the day after her death.

DU'RIS (Lat., from Gk. *Δοῦρις*, *Douris*) **OF SA'MOS** (c.350 B.C.-c.280 B.C.). A Greek historian, a descendant of Alcibiades, and brother

DURHAM CATHEDRAL AND THE RIVER WEAR
FROM A PHOTOGRAPH

of Lynceus. At one time he was tyrant of Samos. He wrote a number of historical works, of which the most important was *Ἡ τῶν Ἑλληνικῶν Ἱστορία*, or a *History of Greece from B.C. 370 to B.C. 281*. Both the judgments passed on him in antiquity and his remaining fragments support the belief that he was merely a careless and uncritical collector of historical materials. Consult: Müller, *Fragmenta Historicorum Græcorum* (Heidelberg, 1806); and Hulleman, *Duridis Samii quæ supersunt* (Utrecht, 1841).

DÜRKHEIM, dṳrk′-hīm. A town of the Bavarian Palatinate, Germany, on the Isenach, at the foot of the Hardt Mountains, about 13 miles west-southwest of Mannheim (Map: Germany, C 4). It is surrounded by vineyards and frequented as a health resort for the saline springs of Philippshalle, which belong to the town. Its chief industries are the manufacture of paper, oil, and paints and the preparation of salt. There is also a considerable trade in grain and wine. At the entrance to the Isenach Valley are the picturesque ruins of the Abbey of Limburg, founded in 1230 by Conrad II. Population, in 1890, 6080; in 1900, 6200.

DURKHEIM, dṳr′kăɴ′, Emile (1858—). A French philosopher, born at Les Vosges. He was educated at the Ecole Normale Supérieure; traveled in Germany and made valuable studies of social conditions there. The first French chair in sociology at the University of Bordeaux was founded for him (1887), and he became a full professor six years later. His special aim was to separate sociology from mere psychology, and to examine social conditions in the light of other observed social facts. In the field of psychology his writings treat of the distinctions between individual mental phenomena and 'folk psychologie.' They include: "L'individualisme et les intellectuels," in *Revue Bleue* (1898), and "Représentations individuelles et représentations collectives," in *Revue Métaphysique* (1898). Mention should also be made of his general study: "La science positive morale en Allemagne," in *Revue Philosophique* (1887); of the journal *l'Année Sociologique*, founded by Durkheim in 1898; and of his books: *De la division du travail social* (1893); *Les règles de la méthode sociologique* (1894); and the especially valuable study, *Le suicide* (1897).

DURLACH, dōōr′lȧG. An old town in the Grand Duchy of Baden, Germany, on the Pfinz, three miles east of Karlsruhe (Map: Germany C 4). Durlach manufactures tobacco, chicory, leather, gloves, brushes, and machinery, and has extensive fruit and grain markets. The environs abound in orchards. On the summit of the Thurmberg is a lofty tower believed to be of Roman origin, which is reached by a cable road. Remains of ancient walls and fortifications are still to be seen. Population, in 1890, 8240; in 1900, 11,400; in 1905, 12,707.

DÜRNSTEIN, dṳrn′stīn. A village of Lower Austria, situated in a highly picturesque spot on the left bank of the Danube, about 45 miles west-northwest of Vienna (Map: Austria, D 2). It is noteworthy for the ruins of a castle where Richard Cœur de Lion is said to have been imprisoned a short time in 1193. Near by, the French were defeated by the Austrians and Russians November 11, 1805. Population, about 700.

DUROC, dṳ′rŏk′, Gérard Christophe Michel, Duke of Friuli (1772-1813). A French soldier and diplomatist. He was educated at the Military Academy of Brienne; joined Napoleon as sub-lieutenant of artillery at the siege of Toulon, and became one of his favorite officers. In the Italian and Egyptian campaigns he was Napoleon's aide-de-camp, and at Marengo served as a brigadier-general. During the Empire he was general of division and Governor of the Tuileries. Because of his shrewdness and the confidence that Napoleon placed in him, he was sent on diplomatic missions to various European courts. He fought at Austerlitz, Aspern, and Wagram, and was killed in a skirmish near Markersdorf after the battle of Bautzen (1813).

DURRA. See Sorghum, paragraph *Non-Saccharine*.

DURUGMUN, dōō′rōōg-mōōn′. A Mongoloid people in Mindoro Island. See Philippines.

DURUY, dṳ′rwē′, Victor (1811-94). A French historian and educator. He was born in Paris, September 11, 1811, of obscure parents, his father being a workman in the lace-works at Gobelins. Duruy did not begin his education until late in life, but was admitted in 1830 to the Ecole Normale Supérieure. He graduated in 1833, and became professor of history in the college at Rheims, but soon received a call to Paris, where for twenty-five years he held an honorable position in the Collège Henri IV. An admirable teacher, he employed his spare time in the writing of text-books on history and geography and soon became prominently known in the field of education. In 1853 he received the degree of doctor of letters, but he did not leave the lycée until 1861, when he was made inspector of the Academy of Paris. He became successively *maître de conférences* at the Ecole Normale, Inspector-General of Public Instruction, and, finally, professor of history in the Ecole Polytechnique. In 1863 Duruy was made Minister of Public Instruction by Napoleon III., whom he knew personally, having assisted that versatile ruler in collecting material for his *Vie de César*. For six years Duruy presided over the Department of Public Instruction, and to him is due in great part the modern system of education in France, especially the organization of secondary instruction. He was liberal in his views and devised many improvements in the educational system of France, which, however, his opponents, the Clericals and Conservatives, vehemently opposed. On the reorganization of the Ministry in 1869, Duruy resigned his portfolio and was given a seat in the Senate. After the events of 1870 he retired into private life. The last years of Duruy's life were spent in historical research, the results of which were his great *Histoire des Romains* (7 vols., Paris, 1879-85), and his *Histoire des Grecs* (3 vols., Paris, 1886-91). An English translation of the former of these appeared in London (1883-86). Most of his other works were school histories in Hachette's series "L'Histoire Universelle," the best-known volumes being the histories of Greece and Rome (Eng. trans. ed. by Mahaffy, London, 1888), and his *Student's History of France* (Eng. trans., New York, 1889). He died in Paris, November 25, 1894. His son, Albert Duruy (1844-87), acquired some reputation as an historical writer on the period of the Revolution, and as a Bonapartist partisan, while another son, Georges, born in 1853, has written a number of romances, historical and political. Consult: Lavisse, *Un Ministre, Victor Duruy* (Paris, 1895); Bigelow, "Lavisse's Life of Duruy," in *American Historical Review*, vol. i. (New York, 1896).

DURWARD, dẽr'wẽrd. Quentin. The hero of Scott's novel of the same name.

DURYÉE, dṳr-yā', Abram (1815-90). An American soldier. He was born in New York City, was educated in the common schools, and afterwards acquired considerable wealth as a dealer in mahogany furniture. He entered the State militia in 1833, became colonel of the Twenty-seventh Regiment (now the Seventh) in 1849, and took a conspicuous part in suppressing the numerous riots which occurred between that time and 1861. At the beginning of the Civil War he raised a regiment which became widely known as 'Duryée's Zouaves.' He was promoted to be brigadier-general of volunteers in August, 1861, but resigned from the service in January, 1863, owing to a disagreement over a question of rank. In 1865 he was brevetted major-general for 'gallant and meritorious services' at the battles of Cedar Mountain, Rappahannock Station, Thoroughfare Gap, Groveton, Chantilly, South Mountain, and Antietam. He was appointed police commissioner of New York City in 1873, and in the following year attacked and dispersed a company of communists assembled in Tompkins Square.

DUSART, dṳ-särt'. Cornelis (1660-1704). A Dutch painter and etcher, born at Haarlem. He was a pupil of Adriaen van Ostade (q.v.). His works are very uneven in quality, some of them equaling the work of his master, in whose style he paints; but most of them are inferior. He usually represents kermesses, tavern scenes, and other popular amusements, and the best of his works are in the galleries of Amsterdam, Dresden, Vienna, and Saint Petersburg.

DUSE, dōō'zȧ, Eleonora (1859—). An Italian actress, born at Vigevano, on the border of Piedmont and Lombardy. Hers was a family of actors, her grandfather having founded the Garibaldi Theatre in Padua, and she appeared on the stage when thirteen years old. Her early stage life in itinerant companies was a succession of privations and hardships, which seriously impaired her health, but she was soon recognized at Naples, and a little later at Milan (1885), as the greatest actress of Italy and one of the greatest of her time. Her career has since been one of extraordinary success.

She won an international reputation at Vienna in 1892, and elicited successively enthusiastic responses in the principal cities of Europe. Her American début she made in January, 1893, as Camille, at the Fifth Avenue Theatre in New York City, and she appeared in London for the first time the same year. In 1897 she went to Paris, where she was regarded as the great rival of Sarah Bernhardt. Among her most noted presentations have been those of Juliet, Francesca da Rimini, Marguerite, Camille, Fernande, Magda, and Paula in *The Second Mrs. Tanqueray*. To show her unusual versatility, she sometimes plays on the same evening such contrasted rôles as Santuzza in *Cavalleria Rusticana* and the rollicking heroine of *La Locandiera*. Several of Gabriele d'Annunzio's (q.v.) plays were written for her, which she has tried, not with uniform success, to render popular. Her art is distinguished for its simplicity, yet subtle intensity of expression. Discarding many of the customary mannerisms of the stage, she gained her extraordinary dramatic power by the abandonment of much that is conventional but unreal in modern acting. In private life she is noted for her dislike of personal publicity. Her marriage did not prove happy, and she separated from Signor Checchi. In 1902 she reappeared in America. Consult, Bracco, *Life of a Famous Actress*, with American press notices (New York, 1893); Mapes, *Duse and the French* (New York, 1898).

DUSOMMERARD, dṳ'sôm'rär'. Alexandre (1779-1842). A French archæologist, born at Bar-sur-Aube. After serving in the army, he devoted himself to archæological studies, traveled through France and Italy, and eventually became the founder of the famous Musée Cluny in Paris. This collection of mediæval implements and objects of art was begun by Dusommerard during the First Empire, and was designed originally to decorate the dwelling of the collector, the so-called Hôtel Cluny. It finally became the greatest collection of its kind in France, and together with the mansion of Dusommerard was after his death bought by the Government and converted into a museum. Dusommerard began the work subsequently published under the title *Les arts au moyen âge* (1838-46), and containing more than 500 plates illustrative of the finest specimens in the museum, to which building the adjacent Palais des Thermes was afterwards added.

DUSSEK, dōō'shĕk, Johann Ladislaus (1761-1812). A Bohemian musician and composer. He was born at Czaslau, Bohemia, and received his earliest musical impulse as a boy singer at the Minorite Church, Iglau. His first teacher was Father Spenar, and his lessons were given during his attendance at the Jesuit College. After this he had a varied career, his reverses being chiefly due to love of luxury, lack of method, and ignorance of business. He has been rightly regarded as the pioneer of national music, and in his pianoforte playing he is credited with rivaling Clementi in the introduction and use of the 'singing tone.' Several of his pianoforte compositions are standard favorites; a pianoforte method published in London had a very extended vogue. He died at Saint Germain-en-Laye.

DÜSSELDORF, dṳs'sel-dôrf. The capital of the District of Düsseldorf, in Rhenish Prussia, situated in the centre of a fertile district, on the right bank of the Rhine, at the confluence of the Düssel with that river, in latitude 51° 13′ N., longitude 6° 46′ E. (Map: Prussia, B 3). Düsseldorf is divided into the Altstadt, on the right bank of the Düssel; the Karlstadt, founded in 1786 by the Elector Karl Theodor, on the left bank; the Neustadt, on the Rhine; and the Friedrichstadt, to the south. It also takes in the suburbs of Unterbilk, Oberbilk, Flingern, and Derendorf. The town is well built and abounds in broad, well-shaded avenues and fine squares. A colossal equestrian statue of the Elector Johann Wilhelm, who founded a famous picture gallery here in 1710—the greater part of which, however, was removed to Munich in 1805—stands in the Altmarkt.

Among the principal buildings of Düsseldorf are the town hall, dating from 1567, with a new wing added in 1885; the Academy of Art; the Kunsthalle with a municipal gallery of modern Düsseldorf artists; the handsome new theatre; the Provincial Ständehaus (House of the Rhenish Estates), in the Italian Renaissance style; the palace of justice; the Reichsbank; and the palatial new post-office. Of the ecclesiastical edifices, the most noteworthy are the Church of Saint Lambert, a Gothic edifice of the fourteenth century, and the Church of Saint Andrew. The Hofgarten is one of the finest public gardens in Germany; in it is situated the War Memorial, erected in 1892 to commemorate the campaigns of 1864, 1866, and 1870-71. Düsseldorf owns and operates a gas plant, its water-works, street railways, and, since 1891, an electric plant. The educational institutions include a number of gymnasia and realschulen, a teachers' seminary, and an industrial art school. The town has been for two centuries an art centre, and is the home of the famous Düsseldorf School of painters. The historic Academy of Art was founded in 1767. Among its 140 pictures there are only a few now of especial interest—an Assumption by Rubens, a Madonna by Bellini, and the remarkable fresco series by Janssen. The historical museum has a valuable collection of documents. There are also an industrial museum and a library with 46,000 volumes. Düsseldorf is one of the chief centres of the iron industry in Germany. It has besides a number of textile mills, breweries, distilleries, etc. The commerce is extensive. Düsseldorf is the seat of many consuls, including one from the United States. Like most German cities, Düsseldorf has increased its population remarkably during the past two decades, owing to the annexation of suburbs. In 1880 it contained a population of 95.190; in 1900, 213,767; in 1905, 253,274.

Düsseldorf was known as early as the twelfth century. It received municipal rights from Count Adolf of Berg in 1288, and subsequently became the residence of the Counts of Berg. In 1609 it came into the possession of the Counts Palatine of Neuburg, and subsequently became part of the Electoral Palatinate, which in 1779 was united with Bavaria. It prospered greatly under the Counts and Electors Palatine, some of the chief buildings and institutions of the city dating from that period. From 1795 to 1801 Düsseldorf was held by the French; in 1806 it became the capital of the Grand Duchy of Berg, and was annexed together with the Grand Duchy to Prussia in 1814. Consult: Ferber, *Historische Wanderung durch die alte Stadt Düsseldorf* (Düsseldorf, 1890); Clemen, *Die Kunstmäler der Rheinprovinz*, vol. iii., part i., *Stadt und Kreis Düsseldorf* (ib., 1894).

DÜSSELDORF SCHOOL OF PAINTING. One of the most important, if not the most important, German school of the nineteenth century. It was the outgrowth of the Academy of Art, founded at Düsseldorf by the Elector Palatine Karl Theodor in 1767, but did not attain importance until Düsseldorf became part of Prussia. The academy was reorganized by Frederick William III., who made Cornelius director. The latter did not hold his post long enough to impress his views upon the school, which represents rather the tendencies of Schadow, under whom it came into great prominence. While the school of Munich, under Cornelius, was a school of drawing, interested chiefly in frescoes, that of Düsseldorf was a real school of painting, which worked chiefly on panels, and paid some attention to color. It was technically superior to all the other German schools. More than any other school it represented the Romantic tendencies in Germany. In secluded Düsseldorf the artists lived apart from the world entirely in the past, and transformed into painting the verses of Goethe, Shakespeare, and the rest. Their works, on the whole, bear unfavorable comparison with those of the French Romantic school, both from the standpoint of feeling and from that of technique. The school suffered much from dissensions between Catholics and Protestants, the former advocating strictly religious subjects, while the latter took a more liberal view. Among the most famous representatives of the school were Lessing, Hildebrandt, Sohn, Rethel, the Achenbachs, and Knaus (qq.v.). It has had a great influence upon art in America, such men as Eastman Johnson, Leutze, and Bierstadt having done much to introduce its methods and style. The fine collection of old masters formerly possessed by the Düsseldorf Academy was transferred to Munich in 1805, but some 14,000 drawings and 24,000 engravings of the great masters still remain. Consult the works entitled: *Die Düsseldorfer Malerschule*, by Fahne (Düsseldorf, 1837); Püttmann (Leipzig, 1839); and Rosenberg (Leipzig, 1886); the monographs on *Die Düsseldorfer Kunstakademie*, by Wiegmann (Düsseldorf, 1854) and Woermann (ib., 1880); and Schadow, *Der moderne Vasari* (Berlin, 1854).

DUSSIEUX, dụ'syẽ', Louis Etienne (1815-94). A French geographer and historian, born at Lyons. He became professor of history at Saint Cyr in 1850. Besides his excellent contributions as a collaborator to the *Encyclopédie Nouvelle* and the *Annales Archéologiques*, he edited the *Mémoires* of the Marquis de Dangeau and of the Duc de Luynes, and the *Lettres intimes* of Henry IV., a work of considerable historical value. His original publications include: *L'art considéré comme le symbole de l'état social* (1838); *Géographie historique de la France* (1844); *Le Canada sous la domination française* (1855); *Cours classique de Géographie* (1859-65); *Le Cardinal de Richelieu* (1885); and numerous essays and other writings, all of which attest the careful research and great versatility of the writer.

DUST (AS. *dust*, Ger. *Dust*, connected with Ger. *Dunst*, vapor, OHG. *dunist*, *tunist*, breath, storm, Goth. *dauns*, odor, Skt. *dhvans*, *dhvas*, to fall to dust, to perish), Atmospheric. It is a familiar fact that dust is always present in the atmosphere, not merely in houses and near the ground out of doors, but over the ocean and even on the tops of mountains. In order to obtain air absolutely free from dust, it may be filtered slowly through plugs of cotton wool, or it may be suddenly expanded so as to cool below the dew-point, when a portion of its moisture will condense upon the particles of dust and cause them to settle quickly to the bottom of the containing vessel. When a beam of sunlight shines through dustless air, nothing is seen by an observer standing at one side, but if dust is present the sunlight is scattered in all directions and the beam of light is said to become visible. When atmospheric dust is collected and examined under a microscope, it is seen to consist largely of grains of pollen, bits of vegetable fibre, and hairs and all kinds of mineral fragments, including occasionally metallic iron. When, on the other hand, dust is allowed to settle upon properly prepared vegetables, or the jellies and broths used for 'cultures' in bacteriology, and is kept in a warm room, there usually springs up in a few days a vigorous growth of fungi and bacteria, showing that living germs were present, although they may have been invisible in the ordinary microscope. Such dust gives rise in nature to growths that were formerly spoken of as spontaneous generation; but it is now abundantly demonstrated that they simply prove the previous existence of living germs. Some of these germs are highly injurious to men and animals, and are the sources of epidemic diseases; others, when brought to the ground by means of rain, may germinate on the wet soil and produce characteristic fungi. These are sometimes black, giving rise to what is called black rain (q.v.); sometimes red, giving rise to red rain or blood rain and occasionally green snow or red snow. When yellow pollen is brought down and spread on the wet ground, it is often spoken of as a rain of sulphur. No fermentation, souring, festering, or other trouble caused by the development of bacteria and fungi can originate in absolutely pure air.

Showers of dust occur in connection with active volcanoes, prairie fires, forest fires, tornadoes, and strong winds, that elevate the dust in one region only to deposit it in another. Ordinary storm-winds sweeping over a forest and robbing the trees of their pollen produce showers of sulphur or other forms of dust within a few hundred miles. Remarkable dust-showers originate in the region of the Sahara in North Africa. This dust, which is exceedingly fine and usually red, has been transported 1200 miles to the north across the Mediterranean into Europe. (See the description of the dust-storm of February 25, 1879, on page 34 of *Bartholomew's Atlas of Meteorology*, and that of the red dust of 1901 in *Nature*). Almost as far to the west and southwest of the Sahara a fine white dust falls on vessels in the Atlantic Ocean during the so-called harmattan (q.v.), or very dry winds blowing out from the interior of the desert region. Examination of this dust shows it to be almost exclusively composed of the tests of diatoms—microscopic organisms, growing on the vegetation in the fresh water of the interior. The formation known in geology as loess (q.v.) is an exceedingly fine, friable soil, easily raised by the wind and carried to great distances. This formation exists in China in layers of several hundred feet in depth, and in the prairie region of North America to a depth of a hundred feet or less, and is supposed by many to owe its origin entirely to the dust carried by the wind in certain seasons of the year. A shower of black snow due to this dust is described in the *United States Monthly Weather Review* for January, 1895, pp. 15-19. Among the most remarkable showers of dust and ashes are those that have attended volcanic eruptions, such as those of Vesuvius. The cloud of dust proceeding from Skaptar Jökull in Iceland during the eruption of May 20 to June 18, 1873, extended southeastward 2000 miles, over all of Europe and still further into Syria. The dust from an eruption of Cotopaxi was calculated by Mr. Whymper to represent 2,000,000 tons of material; that from the volcano Soufrière in the island of Saint Vincent, West Indies, on April 30, 1812, fell on Barbados, 50 miles to the east, to the depth of one inch, and extended thence eastward beyond the horizon during May 1st. The great eruption of ashes and vapor from Krakatoa in the Straits of Sunda, during August 26 and 27, 1883, spread a cloud of dust and vapor over the whole globe between latitudes 10° S. and 60° N., some of which, remaining at a great height, was observable three years later. The dust collected 900 miles west of the volcano was similar in composition to that collected only 100 miles distant. A great fall of dust attended the eruptions on Martinique and Saint Vincent in 1902, and produced striking sunset glows, similar to those that were developed by the ejected ashes from Krakatoa.

The great importance of dust in the formation of cloud and rain has been especially elucidated by the labors of Mr. John Aitken, of Falkirk, Scotland, who has shown that in the ordinary process of the formation of cloud or fog by cooling air the condensation of the moisture takes place first upon the particles of dust as nuclei; that, in fact, every particle of dust collects moisture, and that every particle of cloud or fog implies a nucleus of dust. On this fundamental principle Aitken has based the construction of his so-called dust-counter, which he has made quite portable, and which enables one to determine with close proximity the relative and the absolute dustiness of any sample of air. He has made such determinations in many parts of Europe and in a great variety of places. The dustiest air is found in the cities; thus, in London, Edinburgh, and Paris there are from 80,000 to 210,000 particles per cubic centimeter (about the fifteenth part of a cubic inch). The air having least dust, so far as yet observed, is that of the western Highlands of Scotland—namely, from 7600 down to 16 particles per cubic centimeter; the air of the Swiss mountain-tops has a similar small content of dust. Aitken's investigations have explained quantitatively that which was before known only qualitatively—namely, that the air most soothing to those who are troubled with delicate lungs is that which has the least dust. According to these results, the presence of dust makes it easier for cooling air to form cloud or fog. Cloudy or foggy air must be considered as dustless air in which the dust previously existing is now replaced by minute floating globules of water. If, now, this dustless but foggy air is still further cooled, its surplus aqueous vapor, which does not easily condense upon the globules already present, supersaturates the dustless air, thus bringing about a condition of unstable equilibrium. This condition has been especially investigated by Mr. C. T. R. Wilson, of the Cavendish Laboratory, Cambridge, England, who has shown that condensation eventually takes place, but only after a considerable additional cooling and with violence. In this process latent heat is set free and phenomena produced which imitate those observed in the interior of thunder-clouds from which rain is falling. It would seem plausible to conclude, therefore, that whereas dusty air is necessary for the formation of clouds, dustless air is necessary for the formation of rain.

When dust is very fine and uniform in size, it gives rise to beautiful optical phenomena due to the diffraction and interference of light, such as the wonderful red, green, and yellow sunsets and sunrises, and the blue suns visible during the daytime in the years 1883-85. These occurred in connection with the vapor-dust from the Krakatoa eruption; but similar phenomena have been observed on numerous other occasions after volcanic eruptions.

Among the important works on this subject may be mentioned C. G. Ehrenberg, on *Infusoria* (Leipzig, 1838) and *Micro-geology* (Berlin, 1856); J. W. Bailey, numerous papers in the *American Journal of Science*, from 1838 to 1856; John Aitken, numerous papers in *The Transactions of the Royal Society of Edinburgh*, and his last paper, *Observations of Atmospheric Dust*, read before the Chicago Meteorological Congress of 1893 (see *United States Weather Bureau Bulletin No. 11*, pp. 734-54); Carl Barus, on *Cloudy Condensation* (see bulletins and reports of the United States Weather Bureau); G. J. Symons, *The Eruption of Krakatoa* (London, 1888).

COSMIC OR METEORIC DUST. The fact that meteors entering the earth's atmosphere from interplanetary space are burned up and disappear leads to the rational conclusion that the resulting débris must remain in the atmosphere in the shape of very fine dust, or larger particles gradually descending to the earth's surface. In many cases the cloud left behind a meteor has remained visible for a relatively long period—in some cases three or four hours—during which it changes shape and diffuses, probably being illumined by the sunlight of a distant twilight like the so-called phosphorescent clouds. In a few cases the dust collected by Nordenskjöld from the surface of snow has been found to contain metallic iron and nickel. In still fewer cases hailstones have had a metallic nucleus. Arago first suggested that these metallic dusts are the remnants of the shooting stars or meteors; they have therefore been spoken of as cosmic or meteoric dust, but in all cases except those of metallic iron or nickel the ordinary mineral dusts undoubtedly come from the earth itself. Many volcanic eruptions send immense volumes of dust into the air; in 1883 Krakatoa sent up four cubic miles of solid rock ground into impalpable dust, the finest particles of which floated about for several years. Besides the larger shooting stars and aërolites, there may well exist even the dust in the interplanetary space, some of which must frequently enter the earth's atmosphere; but except in the case of the nickel-iron compounds it seems at present impossible to distinguish such cosmic dust from that which originates on the earth itself.

DUST-WHIRLS AND DUST-STORMS. The eddies of wind, especially those on a hot summer afternoon, that form small whirls of ascending hot air, carry up leaves and dust to a considerable height. Under most favorable circumstances these may be elevated to the level of the clouds, but under ordinary circumstances they are characteristic of the driest weather, and scarcely rise 1000 feet before they subside. On the hot plains of India and the western arid regions of the United States, which are subject to very high temperatures in the sunshine, the dust-column becomes a very tall column, with a rapid whirling motion, having a thin, hazy axis, due to the condensation of aqueous vapor in the region of low pressure that must mark the central axis. The dust-storms of India have been pictured and described best by Baddeley in his book under that name, published in London in 1880. He figures not merely isolated dust-whirls, but groups of many such dancing around a central region, whence they are known as 'dancing devils,' or remarkable combinations of many whirls into figures illustrating most complex forms of vortex motion, some of which are stable and some unstable. These are all caused by the rapid ascent and whirl of air that is heated intensely by contact with the hot soil and hot dust.

DUST COUNTER. An instrument invented by Mr. John Aitken for counting the total number of particles of dust in a small volume of air. In this instrument a definite quantity of air is suddenly and forcibly expanded, whereby it is cooled below the dew-point, and immediately a fog or haze is formed within it whose density depends upon the quantity of moisture and the quantity of dust that is present. Within a short time these particles of fog descend to the bottom, falling upon a plate of black glass ruled off into small squares. With the help of a hand lens it is easy to count the number of particles per square, whence we calculate the number per cubic centimeter of air. Instead of this dust-counter, one may use Aitken's koniscope, in which we estimate the apparent cloudiness due to the dust. These instruments are described in his report in *Bulletin No. 11 of the United States Weather Bureau.*

The investigation of dust is an important branch of work in meteorology and in bacteriology, and the whole subject is known as koniology.

DUS'TAN, HANNAH (1657—?). A heroine of the early Indian wars in New England. At the time of the attack on Haverhill, Mass., March 15, 1697 (see HAVERHILL), the Indians captured Mrs. Dustan and her nurse, Mary Neff, and killed the youngest Dustan child, an infant only a week old. Mrs. Dustan's husband, Thomas Dustan, with their other seven children, however, managed to escape death. The captives were assigned to an Indian family consisting of two men, three women, and seven children, and were led off toward one of the larger Indian villages. On an island (now called Dustan's Island) six miles above the present Concord, N. H., Mrs. Dustan and her nurse, assisted by a captive English boy, Samuel Leonardson, killed and scalped all of their captors except one squaw and a small boy. After a toilsome journey they reached their homes in safety. The story of their exploit spread rapidly, was told and retold at New England firesides for several generations, and has furnished the theme for much romance and verse. The name is also spelled Dustin and Duston. Consult Mirick, *History of Haverhill* (Haverhill, 1832).

DUST-BRAND. See SMUT.

DUSTYFOOT (OF. *piepoudreux*, ML. *pedepulverosus*, peddler). A court of summary jurisdiction established at fairs and markets in England for the speedy determination of questions arising between those who resorted to the same.

See COURT; LAW MERCHANT; PIEPOWDER; STAPLE.

DUŚYANTA, dōō-shyăn′tȧ. In Kalidasa's drama *Sakuntalā*, the husband of the heroine. He is of the lunar race, a descendant of Paru, and father of Bharata.

DUTCH EAST INDIA COMPANY. A trading company composed of smaller companies which were united in 1602. Its privileges included a monopoly of trade beyond the Cape of Good Hope and the Strait of Magellan, and the power of making treaties, maintaining military forces, and founding forts. Batavia, in Java, became the capital of the Dutch East Indies in 1619. During the seventeenth century the company was very powerful in the Indian Archipelago and in South Africa. Its existence was terminated in 1795. See EAST INDIA COMPANY.

DUTCH EAST INDIES. A name applied to the Dutch possessions in the Malay Archipelago lying between latitudes 6° N. and 11° S., and between longitudes 95° and 141° E. (Map: Australasia, D 3). They comprise the following islands and groups:

		Area: English Sq. miles	Population Dec. 31, 1900
	Java and Madura	50,775	28,746,638
Island of Sumatra	Sumatra, West Coast	31,788	1,527,297
	Sumatra, East Coast	35,480	421,090
	Benkulen	9,436	162,396
	Lampongs	11,338	142,426
	Palembang	53,716	804,299
	Atjeh (Achin)	20,549	110,804
	Riau Lingga Archipelago	16,378	86,186
	Banca	4,473	106,305
	Billiton	1,870	43,386
	Borneo, West Coast	56,060	413,067
	Borneo, South and East Districts	157,585	716,822
Island of Celebes	Celebes	49,405	1,436,000
	Menado	22,176	583,000
	Molucca Islands	44,038	410,190
	Timor Archipelago	17,782	742,000
	Bali and Lombok	4,063	1,041,696
	New Guinea to 141° E. long	152,428	240,000
	Total	748,340	37,734,000

The population figures are in many cases based on conjecture, as very little is known about a large portion of the archipelago. The European population numbered 75,800, mostly Dutch; about 537,000 were Chinese, 27,000 Arabs, and 17,000 other Orientals. The government is administered by a Governor-General appointed by the Crown, assisted by a council of five members, whose duties are partly legislative and partly advisory. The colony is divided into twenty-five residencies, of which some are under the direct supervision of Dutch residents, while others are under the rule of native chiefs advised by Dutch officials. The army consisted on Jan. 31, 1906, of 37,858 men, including 1259 officers and 12,164 Europeans, and the navy of 16 vessels and 3662 men. The capital is Batavia. Consult articles on separate islands and groups.

BIBLIOGRAPHY. Bemmelen and Hooyer, *Guide to the Dutch East Indies* (London, 1897); Berg, *The Financial and Economical Condition of Netherlands India* (The Hague, 1895); Chailley-Bert, *La Hollande et les fonctionnaires des Indes Néerlandaises* (Paris, 1893); Cool, *With the Dutch in the East* (London, 1897); Van der Lith and Spaan, *Encyclopedie van Nederlandsch Indië* (Leyden, 1895).

DUTCH GUIANA. See GUIANA.

DUTCH LANGUAGE. Dutch is the language of the inhabitants of the Netherlands and, in a strongly marked dialectic form, of the Boers in South Africa. It was also in general use in and about New York long after the cession of the province to the English. The name Dutch is derived from *Dietsch*, meaning the vernacular, as distinguished from Latin. It is the same word as the German *Deutsch*, with which it is sometimes confounded, as in Pennsylvania Dutch and in the ordinary speech of uneducated persons. The Dutch themselves call their language Nederlandsch, while in German it is called Holländisch. Dutch belongs to the Low Frankish division of the Low German, and is very closely related to the Flemish, with which it is now practically identical in its written form. Like English, the language may be divided into three main periods: (1) Old Dutch, extending to about 1100. The only important monument of this period that has been preserved is a translation of the Psalter. (2) Middle Dutch, from 1100 to 1550. The language during this period suffered similar changes in sounds and inflections to those that can be observed in the contemporary English. As in English, no standard written form of the language was at first recognized, but each writer used his own dialect. In the thirteenth century a determined effort was made to assert the claims of a literary Dutch, the leader in the movement being Jacob van Maerlant (1235-1300). But in spite of all efforts the use of individual dialects continued. (3) Modern Dutch extends from 1550 to the present day. The most important single event in the history of the language during this period was the publication (1619-37) of the Statenbijbel, the authorized version of the Scriptures, which did much to spread the use of this form of Dutch in the Low Countries. The effect of this translation was similar to that of Luther's version upon High German, in establishing a standard of language and orthography that was generally recognized as authoritative. During the eighteenth century the efforts to purify the language were carried to an absurd extent, and it therefore suffered greatly from the mistaken zeal of its users. During the nineteenth century a saner view of the spirit, based upon a more intelligent study of grammar and philology, has given greater freedom of expression. During the past forty years efforts have been made to reform the orthography and to effect uniformity of usage in Holland and Belgium, the present system having been adopted in Belgium in 1864 and in Holland in 1883.

The Dutch language is in its structure practically the same as the other members of the Germanic group of dialects. It belongs in its phonology to the Low German division, so that its consonants agree in general with the English (Dutch *te*, English *to*, German *zu*). Its orthography is somewhat awkward, and does not represent the sounds of the language (e.g. *oe* = *ū*). In inflection and in syntax Dutch corresponds closely to German. It is written in the Roman alphabet, and coincides in the use of capitals almost exactly with English.

The standard modern Dutch dictionary is *Woordenboek der Nederlandsche Taal*, edited by de Vries and others (The Hague, 1864 et seq.). The best etymological dictionary is Joh. Franck's (1884-92). For English students there are Bomboff's (Arnheim, 1877), and Calisch's (Leyden, 1890). Of grammars in English, may be mentioned Ahn's (London, 1887), and Hoogvliet's (The Hague, 1890). The best account of the language outside of Holland is Jan te Winkel's in Paul, *Grundriss der germanischen Philologie*, vol. i. (2d ed. Strassburg, 1901).

DUTCH LIQUID (so called as being first prepared by an association of Dutch chemists), or Ethylene Dichloride. An oily substance obtained by mixing chlorine and olefiant gas. It acts as an anæsthetic, and has been shown to be safer than chloroform. Besides being very costly, however, it is liable to cause irritation of the throat, and is therefore not used and little known.

DUTCH LITERATURE. The dawn of Dutch literature appears in the Middle Dutch sagas of Charlemagne and Arthur in the thirteenth century, adapted from the French epics, and obviously intended for the nobility. Such are Klaas van Haarlem's *William of Orange* (1191-1217); Dederic van Assenede's *Floris and Blanchefleur* (about 1250); an anonymous *Roland Song*, a *Gawein*, and a *Lancelot of the Lake*. *Reynard the Fox* was also done into Dutch about 1250. (See, also, Maerlant.) The Dutch hymns of the thirteenth century are perfunctory, but there are folk-songs and historical ballads of the fourteenth century of some merit. The general tendency in the first half of this century, here as in France, was toward commercial democracy. This appears in Maerlant (q.v.) and in his chief disciple, the moral chronicler Boendale (1280-1365), in Weert (died 1362), and Melis Stoke. With 1350 there is an aristocratic reaction, apparent before in the epics of Jan van Heelu and Hein van Aken (c.1255-1330); but this movement expires in the early fifteenth century with Dirk Potter's *Course of Love*.

Meantime prose romance was cultivated for the vulgar, the *Old Testament* was translated about 1300, a *Life of Jesus*, the Gospel story popularly rendered; and the drama, sacred and semiprofane, shows characteristic traces of the Dutch genius for low comedy. During the fifteenth and sixteenth centuries literature in the Netherlands was dominated by the literary guilds, as burgher in tone as were the Meistersingers (q.v.). These, by public festivals, popular dramas, and social influence, made literature at once democratic and conservative. A new spirit came from the renascence of classical learning in which Dirck Coornhert (1522-90) and Houwaert (1533-99) led, and Cornelis van Ghistele (fl. 1555-83) followed, but with less effect on letters than was exerted by the Reformation, through translations of the *Psalms* (1540, 1566, 1567) and hymns (1562 and 1569), and most of all by the battle-songs of liberty and bitter political scorn of the *Geusen Lieden Boecxken* (1588). The stylistic reformers of this period were the Catholic Anna Bijns (1494-1567?) and the Protestant van Marnix (1538-98).

From the close of the sixteenth century Amsterdam becomes the literary centre, for here only is thought free. Humanism is fostered by Hendrik Spiegel (1549-1612) and Roemer Visscher (1545-1620), and by the Latin scholars Grotius, Drusius, and Vossius. In the next generation the beautiful and accomplished daughters of Visscher, Anna (1584-1651) and Tesselschade (1594-1649), poets both, were the friends, admirers, and critics of the poets of the Dutch Augustan age, Vondel (q.v.), Hooft, Huygens (q.v.). In their salon the comedies of Bredero and his rival Coster, afterwards a diligent cultivator of the dramatic shudder, were first discussed, and here Starter (born 1594), an emigrant from England, introduced to the Netherlands the Elizabethan lyric (1612-14). Cats (q.v., 1577-1660) escaped at Middelburg the Visschers' genial influence; nor is it to be found in the Amsterdamer Bekker (1634-98), the most philosophical of writers in Dutch.

The immediate pupils of the classical generation were the dramatists Vos (died 1667), Brandt (1626-85), van der Goes (1647-84), and Oudaen (1628-92), the epic poet Anslo (1626-69), the didactic Dekker (1610-66), Vollenhove (1631-1708), the lyric Luiken (1649-1708), and Jonctijs (1600-52). Fiction was cultivated by Hermskerk, who emulated Urfé in his *Batavian Arcadia* (1637), and was himself imitated by Zoeteboom (*Zaanlandsche Arcadia*, 1658) and Bos (*Dortsche Arcadia*, 1662), while Heinsius (q.v.) preferred to imitate Le Sage (*Mirandor*, 1675).

Drama by 1700 was completely Gallicized and insignificant, and lyric poetry rapidly declined. Prose is the normal vehicle of the eighteenth century thought. Here the first conspicuous figure is van Effen, with his *Hollandsche Spectator* (1731-35), and the next ones the ladies Betjen Wolff (1728-1804) and Aagjen Deken (1741-1804), who in 1780 issued *Letters on Diverse Subjects*, and followed this with three novels unrivaled in Dutch literature (*Sara Burgerhart*, 1782; *Willem Leevend*, 1785; *Cornelia Wildschut*, 1792).

The first signs of the contagion of German romanticism appear in Nieuwland (1764-94), but more obviously and effectively in Bilderdijk (q.v.), though he affected to scorn it as he did Shakespeare. Feith (q.v.) showed himself an avowed disciple of Goethe, and Simons (1755-1812) of Klopstock, though Dutch realism was not without its protesting witnesses in Perponcher (1741-1819) and van Zon (Bruno Dallberg, 1758-1818). More national in his expression of romanticism is Loosjes (1761-1818), a novelist who continues the good tradition of Mesdames Wolff and Deken. Nationally romantic, too, are the poets Tollens (q.v., 1780-1856), Messchert (1790-1844), and Bogaers (1795-1870), whose *Jochebed* (1835), *Voyage of Heemskerk to Gibraltar* (1836), and *Romances and Ballads* (1846) are probably the most significant Dutch poetry of his generation. Nameworthy, too, are the songs in lighter vein of Antoni Staring (1767-1840).

Since the middle of the century the achievements of Dutch scholars, especially in theology and history, deserve special recognition. The most striking novelists are Lennep (q.v.), E. D. Dekker (q.v.), and Maartens (q.v.); the best essayist, Hasebroek; noteworthy poets, Potgieter (1808-75), Nikolaas Beets (1814-1903), Pieter Genestet (1830-61), Da Costa (1798-1860), Alberdingk Thigm (1820-89), Ten Kate (1819-89), Vosmaer (1826-88), Emants (born 1848), and Louis Couperus (born 1863). Among critics are

Reinier van den Brink (1810-65), Jan ten Brink, Jonckbloet, and Huet. J. ten Brink has written a serviceable *Kleine Geschiedenis der Nederlandischen Letteren* (1877); Dr. Jonckbloet, a *Geschiedenis der Nederlandsche Letterkunde* (2d ed., 1873); and van Vloten, a *Schets van de Geschiedenis der Nederlandschen Letteren* (1879). Consult: Mone, *Uebersicht der niederländischen Volkslitteratur älterer Zeit* (Tübingen, 1838); Hellwald, *Geschichte der niederländischen Litteratur* (Leipzig, 1887); Kalft, *Geschildenis der Nederlandsche Letterkunde* (Groningen, 1906).

DUTCHMAN'S-BREECHES. See Dicentra and Plate of Bloodroot, in article Sanguinaria.

DUTCHMAN'S-PIPE. See Aristolochia.

DUTCH REFORMED CHURCH. See Reformed Church in America.

DUTCH RUSH. See Equisetum.

DUTCH SCHOOL OF PAINTING. See Netherlands Schools of Painting.

DUTCH VERSION. See Bible.

DUTCH WEST INDIA COMPANY. A trading company established in 1621, to which was granted monopoly of trade on portions of the American and African coasts, with the right of colonizing and maintaining military and naval forces, with which it plundered the Spanish and Portuguese settlements. It established the Dutch colonies of Brazil, New Netherlands, Guiana, the West Indies, and the Gold Coast. After its dissolution in 1674 a new company was formed which lasted until 1791.

DUTENS, dụ'täɴ', Louis (1730-1812). A French miscellaneous writer, born at Tours. His riper culture was gained while a tutor in England, where he passed the greater part of his life, though frequently engaged diplomatically (he was thrice chargé d'affaires at Turin), and in travel. He took Anglican orders and obtained a living of £800 and a pension. Mackenzie, the English Minister at Turin, left him £15,000. He devoted his affluent leisure to *Recherches sur l'origine des découvertes attribuées aux modernes* (1766), to an *Appel au bon sens* (1777), against the French 'philosophic' vagaries of the time, and to *Considérations théologiques sur les moyens de réunir toutes les églises chrétiennes* (1798), with many archæological treatises, and three volumes of anecdotal *Mémoires d'un voyageur qui se repose* (1806). His most valuable service to letters was a collection and scholarly edition of the *Works* of Leibnitz (6 vols., Geneva, 1769).

DUTERTRE, dụ'târ'tr', Jean Baptiste (1610-87). A French Dominican missionary, born at Calais. For seventeen years he lived among the islands of the French West Indies, and he described them and their history in a *Histoire des Antilles habitućes par les Français* (1667-71).

DUTIES. See Customs Duties.

DUTROCHET, dụ'trô'shâ', René Joachim Henri (1776-1847). An eminent French physiologist. In 1808 he was appointed by Joseph Bonaparte head physician to the military hospital at Burgos, Spain, then devastated by typhus fever. He returned to France, however, in the following year, and gave himself up exclusively to the study of physics and physiology. In 1831 he became a member of the Institute. The results of his researches are contained in his *Mémoires pour servir à l'histoire anatomique et physiologique des végétaux et des animaux* (1837).

DUTT, dŭt, Toru (1856-77). A Hindu poet, born in Calcutta. From 1869 to 1873 she studied in Europe. She translated into English the *Vishnupurana*, and wrote original verse in Hindustani, French, and English. Her first volume was *A Sheaf Gleaned in French Fields* (1876). Her *Ancient Ballads and Legends of Hindustan* (with *Memoir* by Edmund Gosse) appeared in 1882.

DUT'TON, Clarence Edward (1841—). An American geologist and soldier, born at Wallingford, Conn., and educated at Yale, where he graduated in 1860. He was an officer in the volunteer forces during the Civil War, after which he began the study of geology, and in 1875 was detailed to assist in Major John W. Powell's survey of the Rocky Mountains. He was connected with the United States Geological Survey in 1880-91, and in 1887 was put in charge of the division of volcanic geology and seismology. He was promoted to the rank of major in the army in 1890. In 1884 he was elected to the National Academy of Sciences. His publications include: *High Plateaus of Utah* (1880); *Tertiary History of the Grand Cañon District* (1882); *Hawaiian Volcanoes* (1884); *Mount Taylor and the Zuñi Plateau* (1886); *The Charleston Earthquake of 1886* (1889); *Earthquakes in the Light of the New Seismology* (1904).

DUTTON, Henry (1796-1869). An American jurist. He was born in Plymouth, Conn., and graduated in 1818 at Yale, where he was for many years professor of law. He was Governor of Connecticut in 1854-55; and from 1861 to 1866 was judge of the Superior Court and of the Supreme Court of Errors. He published an analytical digest of the Connecticut Reports in 1833, was a member of the committees of 1849 and 1866 appointed by the Legislature to revise the statutes of the State, and in 1854 was chairman of a committee which compiled the State statutes.

DUTY OF WATER. The ratio between a given quantity of water used in irrigation and the area of the crop to which it is applied. See Irrigation.

DUUM'VIRS (Lat. *duumviri* or more correctly *duoviri*, from *duo*, two + *vir*, man). A committee of two; a general term in Roman administration, applicable to several different functions. Most important was the function of *duoviri iure dicundo*, or "duumvirs with judiciary powers," the chief officers of many municipal towns. Every fifth year the duumviri exercised special censorial powers, and were called *duoviri quinquennales*. In Rome there were *duoviri sacrorum* in charge of the Sibylline books, and *duoviri navales*, for the recruiting of the navy, etc.

DUVAL, dụ'väl', Alexandre (1767-1842). A French dramatist, born at Rennes. In his youth he was by turn sailor, engineer, actor, and finally director of the Odéon and member of the Academy (1812). As dramatist, he is considered a good painter of the life of his time. A collection of his plays is included in his *Œuvres* (1822-25). Besides his plays he wrote a romance, *Le misanthrope du Marais* (1832); *De la littérature dramatique* (1833), a critical study; and *Le théâtre français depuis cinquante ans* (1838).

DUVAL, Amaury (1760-1838). A French archæologist, brother of the preceding, born at Rennes. He was secretary of the French Legation at Rome, and upon his return to Paris was made a member of the Institute (1811), and of the Academy of Inscriptions (1816). His principal works are: *Des sépultures chez les anciens et les modernes* (1801); *Précis de la méthode d'éducation de Pestalozzi* (1804); *Monuments des arts du dessin chez les peuples tant anciens que modernes* (1829).

DUVAL, Claude (1643-70). A notorious highwayman. He was born in Domfront, Normandy, but went to England as a follower of the Duke of Richmond at the time of the Restoration. Here he soon took to the life of a highwayman, and became famous no less for his gallantry to women than for the extent and audacity of his robberies. He was finally captured, while intoxicated, and on January 21, 1670, was executed at Tyburn. His body was buried in Covent Garden Church, where a memorial was erected bearing an inscription beginning with the lines:

> Here lies Du Vall: Reader, if male thou art,
> Look to thy purse; if female, to thy heart.

Consult Smith, *Lives of the Highwaymen* (London, 1720).

DUVAL, Matthias (1844—). A French physician and physiologist. He was born at Grasse (Alpes Maritimes), and was educated at Strassburg, where he directed the ambulance service during the siege of 1870. Subsequently he joined the army of Bourbaki as chief of the medical staff. He was made professor of anatomy at the Ecole des Beaux-Arts, director of the anthropological laboratory of the Ecole des Hautes Etudes in 1880, and professor of histology and director of the Anthropological Institute in 1887. His more important publications (chiefly researches in anatomy and embryology) include: *Cours de physiologie* (translated by E. Kuess, as *A Course of Lectures in Physiology,* 1876); *Précis de technique microscopique et histologique* (1878); *Manuel du microscope* (with Lereboullet, 1873); *Manuel de l'anatomie* (with Morel); *Atlas d'embryologie* (1889); and *Eléments d'histologie* (1896).

DUVENECK, dŭ'v*e*-nĕk, Frank (1848—). An American painter and etcher. He was born at Covington, Ky., and studied in Munich, Germany, under Dietz, where he also practiced, and was active as a teacher. Afterwards he resided in Venice, for a time in Boston, and after 1881 at Florence. Among his paintings are "A Circassian" (1875), a portrait of Charles Dudley Warner (1877), and "The Professor" (1878). At the St. Louis Exposition in 1904 he exhibited a portrait of his mother and "The Yacht Harbor."

DUVERGIER DE HAURANNE, dụ'vâr'zhyâ' d*e* ô'rän', Jean (1581-1643). A French theologian. He was born in Bayonne; studied at Louvain, where Jansen was his fellow-student, and in 1620 was made Abbot of Saint Cyran. In Paris he formed a connection with the influential Arnauld family, and together with Angélique Arnauld, directress of the Convent of Port Royal, he completely reformed that institution. He made influential enemies, and was imprisoned by Richelieu at Vincennes in 1638. After Richelieu's death he was released. See Jansenism.

DUVERGIER DE HAURANNE, Prosper (1798-1881). A French publicist, born at Rouen. He was the son of Jean Marie Duvergier de Hauranne, a publicist and man of politics, and while still young collaborated with Rossi and Guizot on the *Globe,* and later on the *Revue Française.* As Deputy from Sancerre he supported the views of Casimir-Périer and Thiers, and became greatly opposed to the policy of his old friend Guizot. In 1848 he was elected a member of the Constitutional Assembly, and his Royalist opinions caused him to be arrested and exiled in the coup d'état that followed. In 1852 he returned to France and wrote his *Histoire du gouvernement parlementaire en France de 1814 à 1848* (1857-1873). For this and other writings he was elected a member of the Academy (1870). Six years afterwards he entered the Senate, but his interest in public affairs had declined, and he soon retired permanently. His articles contributed from time to time to the *Revue des Deux Mondes* are among the most important of his publications.

DUVERNEY, dụ'vâr'nâ', Guichard Joseph (1648-1730). A French anatomist, born at Feurs (Loire). His notably successful lectures on anatomy in the hall of Saint Côme in Paris secured for him an appointment in 1679 to the professorship of anatomy at the Jardin du Roi. Perhaps no other Frenchman since Riofan did so much to advance the interests of the science, especially as regards his researches on the physiology of sight and on the relation between the external and the internal ear, as embodied in his work entitled *Traité de l'organe de l'ouie* (1683; frequently reprinted).

DUVERNOIS, dụ'vâr'nwä', Clément (1836-79). A French journalist and editor, born in Paris. He wrote considerably for various newspapers—*La Liberté, Le Courrier de Paris, L'Epoque,* and others. In 1868 he founded and became editor of *Le Peuple* (from 1869 *Le Peuple Français*), a journal inspired by Napoleon III., subsidized by Government funds, sold cheaply, and made an important agency in strengthening the cause of the Empire among the masses. He was in 1869 elected a Deputy from Hautes-Alpes in the Corps Législatif. In 1870 he moved a vote of lack of confidence in the Ollivier Cabinet, thereupon succeeded by the Palikao Ministry, in which he assumed the portfolio of Commerce and Agriculture. After the Revolution of the Fourth of September, he withdrew to England, but returned in 1871 and founded *L'Ordre,* an Imperialistic sheet, conducted after the fashion of *Le Peuple.* The failure for large amounts of the Territorial Bank of Spain, of which he was a director, brought upon him two years' imprisonment for fraud. He published several works on contemporary politics.

DUVERNOY, dụ'vâr'nwä', Georges Louis (1777-1855). A French naturalist. He was invited by Cuvier to assist him in his work on comparative anatomy, and edited the last three volumes of Cuvier's *Leçons d'anatomie comparée.* After practicing medicine for twenty years, he was chosen professor of natural history at Strassburg in 1827, and from 1837 until his death was a professor in the Collège de France, first of natural history and afterwards of comparative anatomy.

DUVEYRIER, dᴜ'vâ'ryâ', Henri (1840-92). A French explorer. He was born in Paris, studied geography and Arabic in Germany, and for a time was associated with the African traveler Heinrich Barth, in London. He subsequently returned to Paris, and devoted himself to the study of the natural sciences. He explored the northern Sahara, and finally penetrated to the centre of the Sudan. On his return he published *Exploration du Sahara*, vol. i.; *Les Tuâreg du Nord* (1864); and received from the Société de Géographie in Paris its gold medal.

DUX, duks (Bohemian *Duchcov*). A town of Bohemia, situated about 18 miles west-southwest of Aussig (Map: Austria, C 1). The castle of Count Waldstein contains a picture gallery, a library of some 24,000 volumes, and many relics of the owner's celebrated ancestor Wallenstein. The town has manufactures of glass, pottery, porcelain, and sugar. Population, in 1890 (commune), 10,141, mostly Germans; in 1900, 11,921.

DUYCKINCK, dī'kĭŋk, Evert Augustus (1816-78). An American editor, born in New York City. He was educated at Columbia College; traveled in Europe, and made early contributions to periodicals. From 1840 to 1842 he edited, with Cornelius Mathews, the monthly *Arcturus*. From 1847 to 1853, with a year's break, he edited, with his brother George Long (1823-43), the *Literary World*, an important weekly review. In 1854-55, again with his brother, he prepared the two volumes of the well-known *Cyclopædia of American Literature*, a most useful publication. A full list of his voluminous biographical works and of his literary compilations is unnecessary, but a few titles may be given: *Wit and Wisdom of Sydney Smith* (1856); *History of the War for the Union* (1861-65); *Poems Relating to the American Revolution* (1865); *Poems of Philip Freneau* (1865); *National Portrait Gallery of Eminent Americans* (1866).

DUYCKINCK, George Long (1823-63). An American editor and author, born in New York City. He graduated at the University of New York in 1843; was admitted to the bar, but never practiced the law, and was associated with his brother (E. A. Duyckinck) in the preparation of *The Cyclopædia of American Literature* (2 vols., 1855). His strong interest in all that pertained to the Protestant Episcopal Church induced him to undertake a series of biographies of English clergymen of that denomination. The volumes treat of George Herbert (1858), Thomas Ken (1859), Jeremy Taylor (1860), Hugh Latimer (1861).

DUYSE, doi'ze, Prudens van (1804-59). A Flemish poet, born at Dendermonde. He served as archivist in his native town, and afterwards at Ghent; was a member of many learned societies in Belgium and France, and contributed greatly to the revival of Flemish literature, both by his poems and dramas, and by studies in the history and literature of Flanders. He was less remarkable for genius than for fertility, though several of his productions in both prose and poetry obtained prizes from literary societies. His more important poetical publications, issued at various dates from 1836 to 1859, are: *Vaderlandsche Poëzy* (Patriotic Poetry); *Natalia* (Birthday Poetry); *Elegiën*; *Gedichtjes voor Kinderen* (Poetry for Children); *Het Klaverblad* (The Cloverleaf) and *Nieuwe Kindergedichtjes* (New Poems for Children).

DVINA, dvē-nä'. An important river of northern Russia, formed by the union of the Sukhona and the Jug, at the town of Veliki Ustug, Government of Vologda (Map: Russia, F 2). It flows northeast to its junction with the Vitchegda, and then, turning northwest, enters the White Sea by a wide estuary, about twenty-six miles below Archangel. The length of the river is over 760 miles from the source of the Sukhona and over 1100 miles from the source of the Vitchegda. It is navigable from its junction with the Vitchegda, a distance of over 400 miles. The basin of the river has an area of over 140,000 square miles. The chief tributaries are the Vitchegda, which exceeds in the volume of its waters the upper course of the Dvina, the Pinega, and the Vaga. The Vitchegda, Jug, and Sukhona are navigated by steamers. The Dvina is connected by canals with the Volga and the Neva.

DVOŘÁK, dvôr'zhăk, Antonin (1841-1904). A famous Bohemian composer, born at Mühlhausen. He was to follow the occupation of his father, the butcher and innkeeper of the village, but, upon the advice of Dvořák's schoolmaster, his first teacher in singing and violin, he was sent, at the age of twelve, to Zlonitz to study the piano, organ, and theory of music, and, two years later, to Kamenitz, where he remained for a year with the organist Hancke. The result of his studies, a polka in orchestral score, at its first performance proved a failure: the young composer was innocent of the existence of transposing instruments, and the trumpets played a fourth higher than intended. In 1857, on his father's promise of a small allowance, he entered the organ school of the Society for Church Music at Prague. Shortly afterwards the meagre pittance was cut off, and the composer had to make a living by playing the viola in small bands and cafés, until, in 1862, the orchestra of which he was a member was engaged at the newly opened Bohemian Theatre in Prague, which in 1871 became the National Theatre. Here he became acquainted with Karl Bendl, and through him first obtained access to orchestral scores of Beethoven's compositions. The study of original scores induced him to try his hand in the larger forms, and he wrote symphonies, an opera, and chamber music, though his first important work to be heard, the cantata *Die Erben des weissen Berges*, was not given until 1873. Its success was quite out of the ordinary, and the Austrian Government, after a time, granted him, for his *Sounds from Moravia*, an annual stipend of $160, later increased to $240. The composer now heard *Die Meistersinger*, and set out to write a comic opera, *The King and the Collier* (1874). The score proved such an unproducible monstrosity that it had to be rewritten from the first bar to the last, and then it won quite a success (1875). About this time, through the offices of Hanslick and Brahms, the judges who had awarded him the stipend, Dvořák received an order from Simrock, of Berlin, and the resulting set of *Slavonic Dances* for pianoforte duets rivaled Brahms's *Gypsy Dances* in their sudden and continued popularity. But his greatest success awaited him in England. In 1883 his *Stabat Mater,* once rejected by the Austrian Government jury, stirred up a genuine furor, and thereafter England became the home of his musical activity. *The Spectre's Bride* (cantata, Birmingham, 1885) repeated the success of *Stabat Mater. Saint Ludmilla* (oratorio, Leeds, 1886) and the *Requiem Mass* (1891) were other works written for English festivals. In 1892 he was engaged as director of the New York National Conservatory at a salary of $15,000 a year, a post which he held for three years. While in the United States he grew interested in the music of negroes and Indians to the point of introducing their melodies into his symphony *From the New World,* and the overture *In Nature.* After 1895 he lived in Prague, writing in 1899 the opera *Der Teufel und die wilde Käthe.* He was made an honorary member of many musical organizations, and the degree of Doctor of Music was conferred upon him by the universities of Prague and Cambridge. Later he was called to the Austrian House of Peers. Besides much chamber music, he wrote five symphonies, many sacred compositions, and a number of operas which enjoy great popularity in his native land. His pianoforte compositions are the least significant portions of his contributions to contemporary music. With Smetana (q.v.) and the Young Russian School, Dvořák has called the world's attention to the inexhaustible wealth of folksongs possessed by the Slavs. While strongly national in the character of their music, the Slavic composers, and Dvořák among them, as a rule do not transplant the folk-themes bodily, as did Liszt with the Magyar melodies. They imbue their music with the national spirit, which is most striking in rhythms and harmony; and in this line, Dvořák's themes, though at times cheap in texture, carry the musician away by the sheer force of their originality and freshness. A master of orchestral color after long years of practical apprenticeship in the orchestra, Dvořák reveals his weakness when attempting to write within the boundaries of strictly classical forms, in which he had little training beyond his own studies of scores. Yet to this very independence the world is indebted for the introduction of new forms—the Dumka (literally a little musing, a sort of intermediary between elegy and ballad) for the slow movement, and the Furiant (a sharply accented Bohemian dance of vertiginous rapidity and ever-changing rhythm) for the scherzo. Consult Zubatky, *Dvořák* (Prague, 1886).

DWALE. See BELLADONNA.

DWARF (AS. *dweorg, dweorh,* Icel. *dvergr,* OHG. *twerg,* Ger. *Zwerg,* dwarf). In general, an undersized (and often deformed) human being. The term is applied specifically to the Akka (q.v.) tribe, and some other peoples in Central and Southern Africa, the Andaman Islands (see MINCOPIES), the peninsula of Malacca (see SEMANGS), and the Philippines (see ÆTA). The dwarf tribes that are grouped around the lowest limits of human stature have always been a subject of great interest, both to laymen and to scientific men. A large part of this interest, however, is due to the widespread curiosity with regard to the abnormal, such as has from time immemorial centred in those rare departures from average height occurring among civilized races. Dwarfs are really the result of an anomaly of development, and usually manifest what are known as pathological characters. Thus, most cases of dwarfism show traces of rickets (q.v.), which is a disorder of nutrition, where the process of ossification is arrested at a period when the bony tissue is about to become thoroughly ossified. In many instances dwarfs are well formed, and, to all appearances, perfectly normal in physical and mental characteristics. It has been observed that, in contrast with the giants, the mind of dwarfs is acute and active; in character they are often sensitive and revengeful.

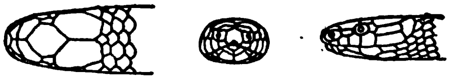
Formerly dwarfs were attractions in the entourages of kings; since then they have generally been exhibited for gain. Perhaps the most remarkable of these little folk is the feminine dwarf Hilany Agyba, of Sinai, 15 inches in height. The height of the celebrated Bébé of King Stanislas, of Poland, was 89 centimeters; another, twenty-five years of age, and 56 centimeters in height, was presented to Henrietta of France in a pie. The hunchback dwarfs of Philip IV. were immortalized by the great Spanish painter Velasquez. Topinard has observed dwarfs that weighed as low as from four to eight kilograms. The infrequency of dwarfs among the lower races of mankind is probably due to natural selection, as well as to the custom of destroying abnormalities.

Stories of dwarfs, brownies, elves, etc., are familiar in the folk-lore of nearly every tribe on earth, though the greatest development of these myths seems to be among the peoples of Aryan descent. Lately a theory has been advanced that the belief in brownies in England is a survival from ancient times, when a small, dark race of aborigines inhabited the country, and that the folk-tales have an actual basis of fact.

BIBLIOGRAPHY. Man, *Aborigines of the Andaman Islands* (London, 1873); Schweinfurth, *Heart of Africa* (London, 1885); Junker, *Travels in Africa,* translated by Keane (3 vols., London, 1890-92); Tyson, *Philological Essay Concerning Pygmies of the Ancients,* edited by Windle (London, 1894); Quatrefages de Bréau, *The Pigmies,* translated by Starr (New York, 1895); Burrows, *The Land of the Pigmies,* with introduction by Stanley (New York, 1898); Brinton, "Dwarf Tribe of the Upper Amazon," in *American Anthropologist* (Washington, 1898); Picard, "Les pygmies," in *Science sociale,* vols. xxvii., xxviii. (Paris, 1899).

DWARF LEMUR. A chirogale or mouse-lemur of the genus Microcebus. See MOUSE-LEMUR.

DWARF SNAKE. Any of a large variety of small, slender, seclusive serpents, forming the colubrine group Calamarinæ, and represented in the warmer parts of the whole world. The typi-



DWARF SNAKE (*Carphiophlops vermis*).
(Top, face, and side view.)

cal genus, Calamaria, belongs to the East Indies, where these snakes are numerous under logs and in similar hiding-places, and form a considerable part of the food of other snakes. Several genera and numerous species are to be found in tropical America and Mexico; and one species, *Haldea striatula*, usually included in this group, though considered by Cope a nearer ally of the water-snakes (Natricinæ), is common in the southern United States. It is a pretty little creature, about the size and shape of a lead-pencil, brown above and yellow or reddish beneath, with a chestnut band across the head. It hides from view, lives upon insects, and is perfectly harmless. The representatives of the calamarine dwarf snakes in the United States belong to the genus Carphiophiops, several species of which occur in the warmer half of the country, inhabiting rotten logs and similar hiding-places. The general colors are glossy brown above and yellowish or salmon-color below.

DWARKA, dwär'kȧ. A town of Gujarat, India, on the Arabian Sea, on the west side of the Kathiawar Peninsula (Map: India, A 4). It is celebrated as the birthplace and residence of Krishna, to whom a great temple is here dedicated. It is a resort for Hindus, over 10,000 pilgrims visiting the shrine annually. Population, 5000.

DWELSHAUVER-DERY, dvĕl'zô'vâr'-dâ'rā', VICTOR (1836—). A Belgian engineer and physicist, born at Dinant. He was educated at the universities of Brussels and Liège, and obtained the chair of engineering at the latter institution in 1869. He was the commissioner of the Belgian Government at several international expositions. His writings are devoted chiefly to the regulation of machinery and to the theory of heat-engines. He has reduced the modern theory of steam-energy to exact figures, basing his calculations largely upon the calorimetric methods of Hirn. His publications include: *Le monde ou nous vivons* (translated by Anstey, 1871); *Principes de la résistance des matériaux* (1878); *Exposé succinct de la théorie des moteurs-à-vapeur* (1880-82); and *Etude expérimentale thermique de la machine-à-vapeur* (1892).

DWERNICKI, dvĕr-nĭts'kē, JOZEF (1779-1857). A Polish general, prominent in the Revolution of 1830-31, born in Warsaw. In 1826 he became a Russian general of brigade. Upon the outbreak of the Revolution of 1830-31 he was appointed to organize the Polish cavalry service, and on February 14 and 19, 1831, defeated the Russians at Stoczek and Novawicz. He was subsequently taken prisoner by the Austrians and deported to Hungary, where he resided under surveillance. His *Pamietniki* ("Memoirs") were edited by Plagovski (1870).

DWIGHT, BENJAMIN WOODBRIDGE (1816-89). An American educator and author. He was born in New Haven, Conn., and was educated at Hamilton College, New York, and at Yale Theological Seminary, where he graduated in 1838. In 1846 he founded the Congregational church at Joliet, Ill., and after acting for two years as its pastor, removed to Brooklyn, N. Y., where he established the Dwight High School, which he conducted for twelve years. From 1858 until 1867 he conducted similar schools at Clinton, N. Y., and in New York City. His publications include: *Modern Philology* (1864); *History of the Dwight Family in America* (1874); *Woman's Higher Culture; The True Doctrine of Divine Providence* (1887).

DWIGHT, EDMUND (1780-1849). An American merchant. He was born in Springfield, Mass.; graduated at Yale in 1799, and studied law with Fisher Ames. The manufacturing firm which he established in Boston founded Chicopee Falls in 1822, Chicopee in 1831, and Holyoke in 1847. Dwight was instrumental in establishing the Massachusetts State Board of Education, and the present normal school system of the State.

DWIGHT, HARRISON GRAY OTIS (1803-62). An American missionary. He was born at Conway, Mass., graduated at Hamilton College in 1825, studied theology at Andover, and was afterwards sent by the American Board to assist in the Armenian missions. Among his works are: *Christianity Revived in the East* (1850), and a "Catalogue of Armenian Literature in the Middle Ages," in the *Journal of the American Oriental Society* (Boston).

DWIGHT, JOHN SULLIVAN (1813-93). An American music critic, born in Boston, Mass. While at Harvard (class of '32), he aided in founding the Harvard Musical Association. He became a Unitarian minister, but later joined the Brook Farm Community, where he was musical editor of the *Harbinger*. In 1852 he founded *Dwight's Journal of Music*, which he conducted with such ability and consistency of purpose that at one time it enjoyed wide influence. Dwight was, however, a classicist, and unable to keep up and sympathize with the tendencies of modern music, especially with Wagner. The *Journal* gradually lost in circulation, and in 1881 it was discontinued.

DWIGHT, NATHANIEL (1770-1831). An American physician. He was born in Northampton, Mass., and was the brother of the elder Timothy Dwight, president of Yale. He was probably the first to propose the present system of retreats for the insane, and his *Short System of the Geography of the World* (1814) was the first school geography published in the United States. He also wrote *A Compendious History of the Signers of the Declaration of Independence* (1831).

DWIGHT, SERENO EDWARDS (1786-1850). An American clergyman and writer, a son of President Timothy Dwight, of Yale. He was born at Greenfield Hill, Conn.; graduated at Yale in 1803; studied and practiced law, and afterwards devoted himself to the study of theology and became pastor of the Park Street Church, Boston. From 1833 to 1835 he was president of Hamilton College. He published the *Life of David Brainerd* (1822); the *Life and Works of Jonathan Edwards* (his great-grandfather) (1830); and a volume entitled *The Hebrew Wife* (1836), written to prove the unlawfulness of marrying a deceased wife's sister. Consult *Select Discourses*, with a memoir by his brother, William Theodore Dwight (New York, 1851).

DWIGHT, THEODORE (1764-1846). An American lawyer and journalist. He was born at Northampton, Mass., and was the brother of Timothy Dwight, president of Yale, and the grandson of Jonathan Edwards. He was a distinguished lawyer and a leader of the Federalist Party; was a member of Congress in 1806-07; and was secretary of the famous Hartford Convention in 1814. His talent as a writer made him a brilliant editor in turn of the Hartford *Mirror*, the Albany *Daily Advertiser*, and the New York *Daily Advertiser*, which he founded in 1817. Among his publications are: *Life and Character of Thomas Jefferson* (1839); and a *History of the Hartford Convention* (1833).

DWIGHT, Theodore (1796-1866). An American author. He was born in Hartford, Conn., the son of Theodore Dwight (1764-1846); graduated at Yale in 1814, and devoted himself to editorial work on various papers and magazines, besides taking an active interest in the work of Sunday-schools. Among his publications are: *Tour in Italy* (1821); *First Lessons in Modern Greek* (1833); *The Roman Republic of 1849* (1851); *History of Connecticut* (1841); and *The Kansas War: or, the Exploits of Chivalry in the Nineteenth Century* (1859).

DWIGHT, Theodore William (1822-92). An American jurist. He was born in New York; graduated at Hamilton College; and afterwards studied law at Yale, and was professor of law in Hamilton College, where he established a school of law. From 1858 to 1891 he was professor of law in Columbia College. He published several works on legal subjects, among which are: *Trial by Impeachment* (1867); and *Argument in the Rose Will and Charity Cases* (1863); besides papers in the *American Law Register*, of which he was assistant editor. In 1868 he became non-resident professor of constitutional law in Cornell University, and in 1869 lecturer in Amherst College. He was a member of the New York State Constitutional Convention in 1867; was president of the New York Prison Association; and was an active member of the well-known 'Committee of Seventy' of New York City. He edited Maine's *Ancient Law* (New York, 1864).

DWIGHT, Timothy (1752-1817). An American clergyman and educator. He was born at Northampton, Mass., graduated at Yale College in 1769, was a chaplain in the army during the Revolutionary War, pastor and principal of a well-known boys' school at Greenfield, Conn., from 1782 to 1795. In the latter year he was chosen president of Yale College, and filled the position till his death, January 11, 1817. His most important publication is his *Travels in New England and New York* (1821). Consult his memoir by his son, Sereno E. Dwight, in the latter's edition of his *Theology Explained and Defended* (New York, 1846).

DWIGHT, Timothy (1828—). An American clergyman and educator, born at Norwich, Conn. He graduated at Yale in 1849, studied at the Yale Divinity School, and in 1856-58 at Bonn and Berlin; in 1858 was appointed professor of sacred literature in the Divinity School, and in 1861 was ordained to the ministry of the Congregational Church. In 1886 he was elected president of Yale. He resigned this office in 1899. During his administration, Yale took the title of University and assumed proper status as such. He was particularly successful in obtaining the numerous gifts and endowments necessary to an increase in equipment. In 1878-85 he was a member of the American Committee for the Revision of the English Bible. From 1866 to 1874 he was an editor of the *New Englander* (later the *Yale Review*), in which he published, in 1870-71, a series of articles on "The True Ideal of an American University." He wrote also annotations to the English translation of the volumes Romans, Philippians-Philemon, Timothy-Hebrews, and James-Jude in Meyer's *Kritisch-exegetischer Kommentar zum neuen Testament* (Göttingen, 1832 et seq.); a translation of Godet's *Commentaire sur l'évangile de Saint Jean* (Paris, 1864-65); an *Address Delivered at the Funeral of President Porter* (1892); a *Commemorative Address* in honor of W. D. Whitney and J. D. Dana (1895); *Boston at the Beginning of the 19th Century* (1903); *Memories of Yale Life and Men* (1903).

DWIGHT, William Buck (1833-1906). An American geologist and naturalist, born in Constantinople, the son of Harrison Gray Otis Dwight, the American missionary (q.v.). He came to this country in 1849, and graduated at Yale (1854), Union Theological Seminary (1857), and the Yale Scientific School (1859). After two years (1865-67), spent in examining West Virginia mines, he entered educational work. He was principal of the officers' family school at West Point from 1867 to 1870, and in 1894 was appointed one of the two university examiners for New York State. In 1878 he was appointed professor of natural history and curator of the museum at Vassar College. His most important work as a geologist includes investigation of the Cambrian and Ordovician stratigraphy and paleontology, and an exploration of Dutchess County, N. Y., and the limestone district of the Wappinger Valley. He became a frequent contributor to geological papers, but the results of much of his more important paleontological researches are still unpublished. Professor Dwight was editor of the department of geology in the *Standard Dictionary*. He invented the 'petrotome,' a machine for cutting thin sections of minerals and fossils.

DY'AK, or **DAYAK.** A general name applied by the Malay invaders to the peoples inhabiting the interior and a considerable portion of the coast of the great island of Borneo, who seem to be its aborigines. Physically and linguistically they all belong to the Malayan race, but there are numerous variations from the characteristic type. Dyak culture runs all the way from the savagery of the mountainous interior to the civilization of the coast, where, under Javanese, Bugi, and Chinese influences, the artistic and industrial abilities possessed more or less by all the tribes are seen to better advantage, and many States and Sultanates have from time to time flourished. The Dyaks have taken to Islam less kindly than their kindred, the Malays proper, and some of the uncivilized tribes of the interior probably preserve traits of original Malayan heathenism, elsewhere lost. Intellectually, morally, and socially the Dyak at his best is perhaps superior to the typical Malay, as he also exceeds him in stature and often in good looks. The Dyaks are also less restrained and more given to physical exercise than the Malays proper. The paddle, the spear, the blow-gun, bamboo bridges, cloth-weaving, and metal-work, represent some of the outcrops of Dyak genius. Among the more savage Dyak tribes are the Olo-ut of the central interior; the Punan, farther to the northeast; the Kayans; the Kenyas; the Bahau, Segai, etc. The Milanos about the Redjang River, the Land Dyaks, the Sea Dyaks of Sarawak, Brunei, etc., the Dusun (Idaan) of the northeast, are all more or less civilized. Some of the Dyaks take well to agriculture; and head-hunting and cannibalism, for which the Dyaks were once so famous, are rapidly disappearing. The traditional home of the Dyaks is in the mountains of the central interior, from which the so-called 'Sea Dyaks,' once famous as pirates, have wandered farthest. The results of the Haddon exploring expedition of 1898-99 have added much to our knowledge of the tribes of the interior. Besides the general works on Borneo, consult: Bock, *Head Hunters of Borneo* (London, 1881); Klein, *Die bildenden Künste bei den Dayaks auf Borneo* (Vienna, 1890); Roth, *The Natives of Sarawak and British North Borneo* (London, 1896).

DYAS. See Permian System.

DYBECK, dų'bĕk, Richard (1811-77). A Swedish archæologist and antiquarian, born in Odensvi (Vestmanland). For nearly half a century he made a thorough and illuminating study of the ancient monuments, the proverbs, the traditions, the folk-lore and songs, and the customs of Sweden. Among the most important of his works are *Svenska Runurkunder* (1855-59), and *Sverikes Runurkunder* ("The Runic Monuments of Sweden," 1860-76). Others are *Svenska Fornsaker* ("Swedish Antiquity," 1853-55); and *Mälarens Oar* ("The Islands of Lake Mälar," 1861).

DYCE, Alexander (1798-1869). An English scholar and critic, born in Edinburgh. He was educated at the high school of that city, and at Exeter College, Oxford. After officiating for some time as curate, he settled in London in 1825. His literary reputation is chiefly based on his editions of the older English poets and authors—George Peele, Robert Greene, John Webster, Shirley, Thomas Middleton, John Skelton, Beaumont and Fletcher, Ford and Marlowe, with biographies of the authors and instructive notices. He also edited the poems of Shakespeare, Pope, Akenside, and Beattie, for Pickering's Aldine Edition of the Poets. Two old plays discovered by him, called *Timon* and *Sir Thomas More,* were published for the Shakespeare Society. In conjunction with Collier, Halliwell, and Wright, he founded the Percy Society for the publication of old English ballads, plays, and poems. His ability as a commentator on Shakespeare is proved by his *Complete Edition of the Works of Shakespeare; the Text Revised; with Account of the Life, Plays, and Editions of Shakespeare, Notes, etc.* (1857).

DYCE, William (1806-64). A Scottish historical painter. He was born in Aberdeen, September 19, 1806, the son of a distinguished physician. At the age of sixteen he graduated from Marischal College, University of Aberdeen, with the degree of A.M. Against his father's wishes, he went to London to study painting, but was dissatisfied with the Royal Academy, and in 1825 he proceeded to Rome. During a stay of nine months he studied the works of Titian and Poussin, but on his second journey to Rome, 1827-28, he developed strong pre-Raphaelite tendencies, his work meeting with the enthusiastic approval of Overbeck and the Nazarene painters. Not finding his Madonnas appreciated on his return to Aberdeen, he devoted himself to scientific pursuits, and afterwards to portrait painting, in which he succeeded especially well with women and children. He settled in Edinburgh in 1830, and was made associate of the Royal Scottish Academy in 1837. His pamphlet upon the application of design to manufactures, in 1837, and the publication of his report upon French and German schools of applied art, in 1840, resulted in the National and Provincial Schools of Applied Art being organized in accordance with his ideas. In 1844 he was made professor of fine arts in King's College, London, and in 1848 a member of the Royal Academy.

In the competition for the frescoes of the new Houses of Parliament, held in 1843, Dyce was one of the successful competitors. His "Baptism of Ethelbert," in the House of Lords, was the first to be finished, and was deemed so successful that the other artists were instructed to adapt their design and coloring to his. He executed for the Prince Consort, at Osborne, an impressive fresco, "Neptune Giving the Empire of the Sea to Britannia," and was intrusted with the decoration of the Queen's robing-room at Westminster. The subjects, which he himself had suggested, were from the legend of King Arthur, typifying 'Chivalry,' and the five which he lived to finish are his great masterpieces. He died in London, February 14, 1864.

Dyce's art represents a revolt from the eclectic principles of the Academy, similar to that more definitely inaugurated at a later period by the pre-Raphaelites. It is refined and tasteful, but rather a learned art than one which appeals strongly to the senses. It resembles that of the German Nazarenes, except that his coloring is better. Besides the frescoes mentioned above, among his chief paintings are "Bacchus Nursed by the Nymph" (1827); "Joash Shooting the Arrow of Deliverance" (1844); "Madonna and Child" (1846); "Meeting of Jacob and Rachel" (1850). The National Gallery of Scotland contains a number of his pictures. He was deeply learned in theology and patristic literature, and one of the leaders of the 'High-Church Movement.' He was also a fine organist, and the composer of anthems. For a publication of the Book of Common Prayer, set to the ancient music, he received the Prussian Gold Medal of Science and Art. He also published numerous pamphlets on art.

Consult the article "William Dyce," in the *Dictionary of National Biography* (London, 1888); and in Redgrave, *Dictionary of Artists in the English School* (London, 1878).

DYCK, dīk, Van. See Van Dyck.

DY'EA (American Indian, pack, load). A village in the southern district of Alaska, on Chilkoot Inlet, the east fork of Lynn Canal (Map: Alaska, H 4). It was formerly important as a starting-point for the upper Yukon and the gold-fields of the Klondike, but it has been outstripped by Skagway (q.v.), owing to the opening of the White Pass and Yukon Railroad. The Dyea, or Chilkoot, route begins at Dyea. The village has a considerable transient population; its permanent residents number 261 (census of 1900).

DYEING (OF. *dyen*, to dye, AS. *dēagian*, from *dēag*, color; connected with AS. *dēaw*, dew). The art by which various substances, especially textile fibres, are impregnated with coloring matters with sufficient tenacity to resist the action of water or ordinary wear.

HISTORY. The art of dyeing was known to the ancients, and it is mentioned in the Bible that Jacob gave his favorite son Joseph a coat of many colors, and Moses tells how the skins of the ram and the badger used for the Tabernacle were dyed red. The purple of the Tyrians was known at an early date; the King adopted it as one of his principal ornaments, and it has since continued a badge of royalty. According to Pliny, this purple color was derived from certain shellfish found along the coast of Phœnicia, but the method of its preparation was lost. Pliny is also the authority for the statement that methods of dyeing black, yellow, and green were brought into Greece from India on the return of Alexander the Great. Toward the close of the Middle Ages the art of dyeing was greatly developed in northern Italy, especially in Florence, where the dyestuff archil (q.v.) was discovered about 1300. The early voyagers to America brought back with them new and valuable dyestuffs, such as cochineal, logwood, and quercitron. Subsequently dyeing developed according to the discoveries of new dyestuffs, and the application of improved processes, until about the middle of the nineteenth century. Since then, the natural dyestuffs have been gradually giving way to artificial colors derived mostly from coal-tar (see COAL-TAR COLORS). The most important natural and artificial coloring matters may be found described in articles under their special names. A list of the best-known artificial dyestuffs may be found under COAL-TAR COLORS. Mineral and vegetable dyes were formerly considered more lasting than the artificial ones; but this view has, in most cases, positively no foundation in fact. The accompanying table shows which artificial substances have either partly or completely displaced natural ones in the dyeing of animal and vegetable fibres.

Dye stuffs may be divided into "basic colors," which dye vegetable fibres only after the use of an acid mordant, and "acid dyes," which require basic mordants for the same fibres. Both classes dye animal fibres direct without a mordant. A newer class known as "substantive dyes" can be used with both vegetable and animal fibres without mordanting. Most of the older aniline dyes belong to the first class; alizarine and sulphurated dyes to the second class; the newer azo dyes to the third class. See AZO-COLORS, under the article COAL-TAR COLORS.

MORDANTS. These are substances capable of combining with other substances (the commercial dyestuffs) to form insoluble colored compounds. Thus, aluminum salts make an insoluble red compound with alizarin, and are therefore used as mordants in calico-printing. Ferric salts make, with alizarin, an insoluble dark purple compound, and are likewise employed as mordants in calico-printing. Soluble mordant salts must themselves be transformed into insoluble compounds before they are allowed to form the dyes, in order to prevent the mordanting material from being dissolved out of the fabric when the latter is introduced into the dye-bath. Therefore, after the fabric has become impregnated with the soluble mordant salt, it is treated with ammonia, lime, or hot steam—with a view to transforming the soluble salt into an insoluble hydroxide, or an insoluble basic salt; or else the fabric is treated with sodium phosphate or sodium arsenate—with a view to transforming the soluble salt into an insoluble phosphate or arsenate. In the case of animal fibres, the same end is often attained by simply immersing the fabric in a boiling dilute solution of the soluble salt, the insoluble mordant being then deposited in the fibre directly. The fabric containing the insoluble mordant is ready to be treated with the dyeing substance, the resulting color of the fabric being evidently that of the compound formed by the latter with the mordant. Another method of dyeing with the aid of mordants, extensively employed in calico-printing, consists in mixing the dye directly with the soluble form of the mordant and with starch, dextrin, gum, or some other thickening substance, printing the mixture on the fabric, and then subjecting the latter to a process of steaming. The result is of course the same as in case the other methods are employed; for the steaming process has the effect of transforming the soluble into an insoluble form of the mordant, the latter then combining with the dyeing substance. Mordants may be either basic or acid, the former combining with 'acid dyes,' the latter with 'basic dyes.' The mordants mentioned above are basic, and their compounds with dyes are termed 'lakes.' Among the acid mordants may be mentioned tannin, or tannic acid. After the fibre has been impregnated with this mordant in its ordinary, soluble form, it is passed through a weak solution of chloride of tin or of tartar emetic. These produce, respectively, the tannate of tin or the tannate of antimony (tartar emetic is a compound of antimony), and these insoluble tannates further combine into insoluble colored compounds with dyes.

THEORIES OF DYEING. The question as to whether dyeing involves true chemical combination of the fibres with the dyestuffs or not has not yet been definitely answered. Some investigators believe that dyed fibres are merely mechanical mixtures; others hold that dyed fibres are true chemical compounds; finally, still others hold that they constitute what are now termed 'physical mixtures,' or 'solid solutions.' Those who accept the chemical theory argue that if the dyestuff did not combine chemically with the fibre, then there would be no reason why chemically neutral colored substances should not act as dyes; yet true dyes are generally either acid or basic, while the fibres themselves may be either basic or acid, or else may include both basic and acid constituents. Another argument in support of the chemical theory is found in the fact that some substances, while themselves colorless, are capable of imparting color to fabrics when directly applied to them; the view being that colored substances must be transformed chemically in order to produce color. The principal arguments in favor of the 'physical mixture' theory, advanced by O. N. Witt in 1890, are as follows: (1) Solid fuchsin is green, with a metallic lustre; solutions of

NATURAL DYESTUFFS	ARTIFICIAL DYESTUFFS THAT HAVE DISPLACED THE NATURAL ONES FOR COTTON	ARTIFICIAL DYESTUFFS THAT HAVE DISPLACED THE NATURAL ONES FOR WOOL AND SILK
Quercitron (Still used along with logwood for printing).	*Diamine fast yellow*, B. A. (C.), *Chloramine yellow* (C.), *Chrysophenine* (C.), *Auramine* (H. G.), *Diamine yellow* (H.), *Chrysamine* (H.), *Thioflavine* (G.).	The different mordant coloring yellows; also, *Naphthol yellow*, S. (H.), *Tartrazine*, *Quinoline yellow* (H.).
Persian Berries (Still much used in cotton-printing and with tin salts, but little for wool).	For direct printing, *Auramine*, *Thioflavine*, T. (C.), the latter exclusively for discharges; also, *Chrysophenine* (H.), *Chloramine yellow* (H.), *Oriol* (G.). Important are also colors like *Alizarin yellow* (H.).	For silk: *Tartrazine*, *Fulling yellow* (C.), *Naphthol yellow*, S. (H.).
Weld		*Naphthol yellow*, S., *Fast yellow* (C.), *Tartrazine*, *Fulling yellow* (C.), *Citronine* (G.), *Jasmine* (G.), *Azo-yellow* (H.), *Fast yellow* (H.), *Alizarin yellow* (H.).
Fustic (Still used for printing in connection with logwood, and for dyeing wool).	Same as for Quercitron; also: *Sun yellow* (G.), *Diphenyl fast yellow* (G.), *Cresotin yellow* (G.): further, *Alizarin yellow* and its homologues (H.).	*Anthracene yellow* (C. G.), *Chrome yellow* (C. G.), *Mordant yellow* (C. G.), *Fulling yellow* (C.), *Azo-yellow* (H.), *Fast yellow* (H.), *Alizarin yellow* (H.).
Logwood (Still used as extensively as before, for silk).	*Aniline black*, *Diaminogen black* (C.), *Diamine black* (C.), *Oxydiamine black* (C.), *Columbia black* (C.), *Direct deep black* (C.), *Vidal black*, *Immedial black* (G. H.), and similar sulphated products.	*Naphthol* and *Naphthylamine black* (C. G. H.), *Brilliant black* (C. G.), *Diamond black* (C. G. H.), *Wool black* (C.), *Alizarin black* (G. H.), *Anthracene black* (C. G.), *Azo-acid black* (H.), *Chromotrope S* (H.).
Brasilwood	*Diamine fast red*, F. (C.), *Congorubin* (C.), *Diamine bordeaux* (C.), *Benzopurpurin* (G. H.), *Diamine red* (H.), *Fuchsin* (G. H.), *Hessian purple* (G.), *Saffranine* (H.), *Paranitraniline red* (H.), *Alizarin red* (H.).	*Cloth red* (C.), *Wool red* (C.), *Acid fuchsin* (G.), *Fast red* (H.), *Archil substitute* (G.), *Ponceau* (H.), *Apollo red* (G.), *Rocellin* (G.); in the fulling industry, *Alizarin red* (C. H.), *Diamine fast red* (C.), *Chromotrope* (H.).
Cochineal (Still used to some extent).		Vivid acid wool colors such as *Azoeosin* (G.), *Chromazon red* (G.), *Palatine scarlet* (H. C.), *Brilliant crocein* (H.), *Brilliant cochineal* (C.), and the different *Ponceaux*, etc.
Archil (Almost entirely displaced).		*Acid fuchsin* (C.), *Azocarmine* (C. G. H.), *Archil substitute* (C. G. H.), *Azofuchsin* (C. G. H.), *Lana fuchsin* (C.), *Azorubin* (C.), *Azo-acid fuchsin* (H.), *Rosindulin* (G.), *Apollo red* (G.), *Chromotrope* (H.).
Annatto	Orange colors, as *Chrysophenine* (H.), *Mikado yellow* and *orange* (H.).	
Safflower	*Rhodamine* (C. G.), *Erica* (C.), *Diamine rose* (C.), *Geranine* (C.), *Saffranine* (H.), etc.	
Berberin (Still used to some extent for dyeing silk).		Same as for WELD.
Catechu (Still much used, especially in combination with logwood, for silk).	Diamine colors, *Benzo* and *Congo* colors with supplementary treatment with chrome and copper, recently competed successfully (C.) and *Chrysoidin* (H.), *Vesuvin* (H.), etc. *Alizarin* colors (partly in calico-printing).	
Indigo (Still much used for dyeing cotton and wool).	*Synthetic indigo*, *Indoin* (C. G. H.), *Napthindon* (C.), *Fast cotton blue* (C.), *Methylene blue* (C. H.), *Indamine blue* (H.), *Janus blue* (H.) and the direct coloring and diazotizable blues of the Diamine, Diphenyl, and Benzo color groups. [*Diamine blue* and related colors (H.), *Diaminogen blue*, C. H.] A new product, *Immedial blue* (C. H.), belongiug to the sulphated colors, seems to be among the most important substitutes. In calico-printing, natural indigo has been in part replaced by the *Synthetic Indigo* preparations and by the different basic blues, including *Nitroso-blue*, *Alizarin blue*, etc. (C.).	*Alizarin blue* (C. G. H.), *Synthetic indigo*, *Alizarin cyanin* (C. G. H.), *Anthracene blue* (G. H.), *Chromotrope*, F. B. (H.), *Gallamite blue* (G.), *Gallocyanin* (G.), *Sulphocyanine* (C.), *Lanacyl blue*.

fuchsin are colored red; and fabrics dyed with fuchsin are likewise colored red. (2) Solid rhodamine shows no trace of fluorescence; its solutions are fluorescent; and silk dyed with rhodamine likewise shows distinct fluorescence. The fact that the same dyestuff may impart different colors to different fabrics is compared with the fact that iodine gives different colors in different solvents, and yet there is no reason for assuming that iodine forms chemical compounds with its ordinary solvents. Finally, in accordance with Witt's theory, the function of mordants is explained by the assumption that solutions of these substances in fibres are much better solvents for the dyestuffs than are the pure fibres. However, while interesting because capable of development and quantitative verification, this physico-chemical theory is yet far from being definitely established or generally accepted by chemists.

Dyeing Processes. Cotton, silk, and wool are the textile fibres that are usually subjected to processes of dyeing. Occasionally the material is dyed before spinning, but usually in the state of yarn or thread, and sometimes as woven cloth. Before dyeing, the fibres are first cleaned so as completely to remove all natural and artificial impurities, such as grease and dirt, which tend to produce spots or uneven shades of color, in consequence of improper fixing of the mordant and color. Whenever light and delicate tints are to be dyed on the fibre, bleaching becomes necessary. The preliminary steps in the preparation of cotton consists in boiling the fibre in a weak solution of caustic lye, after which it is rinsed and then steeped in a solution of bleaching-powder and again rinsed. The third step consists in steeping it in dilute sulphuric acid, after which it is again cleansed by washing, and dried. Silk is boiled twice in soap in order to remove the natural silk glue which accompanies the crude fibre, and is then bleached by exposure to sulphurous acid fumes produced by burning sulphur. Wool is cleansed by washing and then steeped in soap and sodium carbonate, after which it is well rinsed in water, by means of which the natural grease of the fibre is removed. It is then bleached with sulphur dioxide. The dyeing of mixed cotton and woolen fabrics such as cashmere and delaines requires special treatment, and the processes must be selected so that the colors of the wool and the cotton shall be identical on the finished material. In dyeing with substantive colors, simple immersion of the fibre in a hot dye-bath and carefully working the material beneath the surface, to secure an even shade, is all that is necessary. The full quantity of the dye is not added at once to the bath, but in successive portions until the desired shade is obtained, the temperature of the bath being gradually raised. The use of mordants has already been noted above. In all dyeing processes, considerable attention must be paid to the permanency of the dyed color, and *fast colors* are those which withstand the action of light and of washing. It is obvious that woolen goods and calicoes, which are worn frequently and may be washed, should be dyed with colors that are more fast than those which are used with silks.

Apparatus. The apparatus of the dyer is very simple, consisting of vats, kettles, and cisterns, which may be of wood, stone, or metal. In Europe the kettles are still heated over open fires, but in America a steam-coil is universally used. A pure water-supply is absolutely essential to successful dyeing. When the available water-supply is contaminated by sewage or the water is hard because of lime salts, artificial purification must be employed. Suspended matter may sometimes be removed by sedimentation or filtration, or the two combined, but chemical treatment may be required to remove these and other impurities.

Bibliography. The literature of dyeing is very extensive, and reference should be had to the articles in the various technical cyclopædias, as well as to the following works: Crookes, *A Practical Handbook of Dyeing and Calico-Printing* (London, 1874); Hurst, *Silk Dyeing, Printing, and Finishing* (Glasgow, 1892); Knecht, Rawson, and Lowenthal, *A Manual of Dyeing, for the Use of Practical Dyers, Manufacturers, Students, and All Interested in the Art of Dyeing* (London, 1893); Fraps, *Principles of Dyeing* (New York, 1903); *Dyer and Color-Maker's Companion* (Philadelphia, 1898); and *Recent Progress in the Industries of Dyeing and Calico-Printing*, being a supplement to Sansone, *The Printing of Cotton Fabrics* (Manchester, 1895); and, id., *Dyeing* (Manchester, 1897); Sadtler, *Industrial Organic Chemistry* (Philadelphia, 1900); Cain and Thorpe, *The Synthetic Dye Stuffs* (London, 1905). See Textile Printing; Coal-Tar Colors; Mineral Colors; Mordants; and special articles on dye-stuffs.

DY'ER, Alexandre Brydie (1817-74). An American soldier. He was born in Richmond, Va., graduated at West Point, and was assigned to the Third United States Artillery in 1837; served in the Florida War in 1837-38, and as lieutenant of ordnance in the War with Mexico in 1846-48, being brevetted captain for gallant conduct. At the beginning of the Civil War he did much to increase the efficiency of the Ordnance Department, and in 1864 was appointed chief of ordnance at Washington, with the rank of brigadier-general, a position which he held until his death. From 1861 to 1864 he had charge of the Springfield (Mass.) Armory, and in 1865 was brevetted major-general in the Regular Army.

DYER, Eliphalet (1721-1807). An American legislator and soldier. He was born at Windham, Conn.; graduated at Yale in 1740; and was admitted to the bar in 1746. He held several colonial offices, and was the original projector of the plan of establishing a Connecticut colony in the Susquehanna Valley, and was sent to England in 1763 as the agent of the company formed for that purpose. He was lieutenant-colonel of a Connecticut regiment in the French and Indian War; was the first commissioner sent by Connecticut to the Stamp Act Congress in 1765; and was a member of every Continental Congress excepting those of 1776 and 1779. From 1776 to 1793 he was a judge of the Superior Court, and for the last four years was Chief Justice.

DYER, George (1755-1841). An English antiquarian. He was born in London, and was educated at Emmanuel College, Cambridge. He contributed 'all that was original' to Valpy's edition of the *Classics* (141 vols., 1809-31), and published a *History of the University and Colleges of Cambridge* (1814).

DYER, John (c.1700-58). An English clergyman and poet. He began but rejected the law, turned painter, and in pursuit of his art wandered through South Wales and the English counties adjacent. After studying in Italy he returned to England to take orders, became vicar of Calthorp (Leicestershire) in 1741, was appointed to Belchford (Lincolnshire) in 1751, and in 1752 received the living of Coningsby, to which in 1755 that of Kirkby-on-Bane was added. His writings include chiefly: *Grongar Hill* (1727), still found in many anthologies; *The Ruins of Rome* (1740), of which Johnson well remarks that "the title raises greater expectation than the performance gratifies;" and *The Fleece* (1757), referred to by Wordsworth in his sonnet "To the Poet, John Dyer."

DYER, Louis (1851—). An American educator and author, born in Chicago, Ill. He graduated at Harvard in 1874 and at Balliol College, Oxford, in 1878, and was assistant professor of Greek at Harvard in 1881-87. In 1889 he was a Lowell Institute lecturer, in 1893-96 a lecturer at Balliol College, Oxford, in 1895-96 acting professor of Greek in Cornell University, and in 1899 a lecturer before the Royal Institution. In 1900 he gave at the University of California a series of lectures which was repeated at many colleges and universities. His publications include a translation of Cossa's *Introduction to the Study of Political Economy* (1893); *The Greek Question and Answer* (1884); *Studies of the Gods in Greece* (1891); *Machiavelli and the Modern State* (1904).

DYER, or **DYAR,** Mary (?-1660). One of the victims of the persecution of the Quakers in early Massachusetts. She and her husband, William Dyer, a milliner, emigrated from London to Boston, Mass., in 1635, but in 1638, owing to their support of Anne Hutchinson in the Antinomian controversy, were forced to remove to Rhode Island. She spent the years 1652-57 in England, where she was converted to Quakerism; and in 1658 was expelled from the Colony of New Haven for preaching Quaker doctrines. In September, 1659, she was arrested and imprisoned in Boston, whither she had gone to visit three Quakers who had already been thrown into prison, and soon afterwards she was banished with the others on pain of death should she remain in the Colony or return to it. In October she returned to Boston and was promptly sentenced to death, but was reprieved after being forced to witness the hanging of two other Quakers, Robinson and Stephenson. In May, 1660, she again visited Boston, was again condemned to death by Governor Endecott for "rebellious sedition and obtruding herself after banishment upon pain of death," and this time was publicly executed by hanging on Boston Common, June 1, 1660. Consult Rogers, *Mary Dyer, the Quaker Martyr* (Providence, 1896).

DYER, Nehemiah Mayo (1839—). An American naval officer, born at Provincetown, Mass. He entered the volunteer navy in 1861, in 1864 was promoted to be acting master and placed in command of the *Randolph*, in 1868 became lieutenant-commander, and in 1883 commander. Promoted to be captain in 1897, he commanded the protected cruiser *Baltimore* in the battle of Manila Bay, May 1, 1898. In 1901 he received the rank of rear-admiral and was retired.

DYER, Thomas Henry (1804-88). An English historian, born in London. For a time he held a commercial position in connection with the West India trade. In 1841 he published his *Tentamina Æschylea*, the result of his studies in the emendation and restoration of passages. Most important among his works are a *Life of Calvin* (1850), a *History of Modern Europe* (4 vols., 1861-64; 2d ed., revised and enlarged, 5 vols., 1877), and *The History of the Kings of Rome* (1868). His *History of the City of Rome* (1865) was the first connected narrative on that subject, and his *Pompeii: Its History, Buildings, and Antiquities* (1867), contained a careful description of the remains so far as known up to that time. His publications were scholarly, derived from authentic sources, profound in their learning, and clear in their structure.

DYER, William Turner Thistleton (1843—). An English botanist. He was born at Westminster and was educated at King's College, London, at Oxford, and at Halle, Germany. He became professor of natural history at the Royal Agricultural College, Cirencester, in 1868, and professor of botany at Royal College of Science for Ireland, in 1870. In 1885 he was made director of the Royal Gardens at Kew. His principal works are an English edition of Sach's *Text-Book of Botany* (1875), editions of the *Flora Capensis* and of the *Flora of Tropical Africa*, and *Index Kewensis* (1905). With Trimen he published *The Flora of Middlesex* (1869).

DYER'S BROOM (*dyer* + *broom*, plant), Dyer's Green Weed, or Woadwaxen (*Genista tinctoria*). A leguminous shrub of European origin, bearing yellow flowers and simple leaves, and said to be the bush Genêt, from which the Plantagenet family took its name. It is used in Russia for preventing hydrophobia; and in Europe its tops were formerly used for a yellow dye. It was extensively cultivated in New England, but has escaped and become established in portions of New York and Massachusetts. Its medicinal value appears to be small.

DY'ERSBURG. A city and the county-seat of Dyer County, Tenn., 77 miles north-northeast of Memphis, on the Illinois Central Railroad, and on the Forked Deer River, at the head of navigation (Map: Tennessee, B 4). It is in a fertile agricultural region, and has cotton gins, a compress, cottonseed-oil mill, saw, planing, and flour mills, wagon-factories, stave and heading factories, a tobacco-factory, foundry and machine shop, wooden-bowl factory, etc. The waterworks and electric-light plant are owned by the municipality. Population, 1890, 2009; 1900, 3647.

DYER'S ROCKET, or Dyer's Weed. See Weld.

DYESTUFFS. See Animal Colors; Coal-Tar Colors; Mineral Colors; Vegetable Colors; Dyeing; Textile Printing.

DYING DECLARATION. See Declaration, Dying.

DYING GAUL. A famous statue of Greek origin in the Capitoline Museum, representing a warrior supporting himself on his shield and dying from a wound in his breast.

DYKE. See Dike.

DYKES, James Oswald (1835—). A Scottish Presbyterian clergyman and educator, born at Port-Glasgow. He studied at the universities of Edinburgh, Heidelberg, and Erlangen, was ordained to the Presbyterian ministry in 1859, and in 1861 became co-pastor with Dr. Candlish of Free Saint George's Church, Edinburgh. In 1869 he was appointed pastor of the Regent Square Church, London, and in 1888 principal of the Theological College of the Presbyterian Church of England. His publications include: *From Jerusalem to Antioch* (1875); *The Law of the Ten Words* (1884); *The Gospel According to Saint Paul* (1888); and *Plain Words on Great Themes* (1892).

DYKES, John Bacchus (1823-76). An English musician and clergyman, born at Hull. He graduated at Cambridge University in 1847, and two years later was appointed minor canon and precentor of Durham Cathedral. From 1862 he was vicar of Saint Oswald's, Durham. He published a number of sermons and tracts, but is best known for his universally popular hymn-tunes.

DY'MOND, Jonathan (1796-1828). An English writer. He was a member of the Society of Friends, and was prominent as an expositor of the principles of his sect. In 1823 he published an *Inquiry Into the Accordance of War with the Principles of Christianity,* which attracted wide attention. His chief work is his *Essays on the Principles of Morality* (1831), which is devoted to the application of moral principles, and attacks war and dueling.

DYNAM'ETER (contracted from *dynamometer,* from Gk. *δύναμις, dynamis,* power + *μέτρον, metron,* measure). An instrument for measuring the magnifying power of a telescope. The power of a telescope is found by dividing the focal length of the object-glass by the focal length of the eyepiece; which quotient equals that obtained by dividing the diameter of the object-glass by the diameter of its range formed at the focus, and seen through the eyepiece. The object of the dynameter is to measure the diameter of this image. Practically the magnifying power may be measured as follows: The telescope is directed to the daylight sky. A small, round, bright spot is then seen on looking at the end of the eyepiece. This spot is an image of the object-glass. The diameter of the spot is measured with a dynameter, or any micrometric instrument capable of measuring small objects accurately. The object-glass being then also measured, a simple division of the object-glass diameter in inches by the diameter of the spot, also in inches, gives the magnifying power.

DYNAMICS (Gk. *δυναμικός, dynamikos,* powerful, from *δύναμις, dynamis,* power, from *δύνασθαι, dynasthai,* to be able). That branch of mechanics (q.v.) which treats of the motion of matter. It embraces the discussion of the conditions under which the motion of matter is changed and the mathematical properties of this motion. Dynamics is sometimes divided into the two great subjects *statics* and *kinetics,* statics being the discussion of conditions under which there is no change in the motion; kinetics, those under which there is change. Dynamics of a 'particle' treats the motion of a geometrical point endowed with mass. 'Rigid' dynamics treats the motion of large, rigid bodies; that is, those made up of particles so connected that they have no relative motion.

DYNAMIC UNITS. See Mechanical Units.

DYNAMITE (from Gk. *δύναμις, dynamis,* power). An explosive substance consisting of nitroglycerin and an absorbent such as infusorial earth (*Kieselguhr*) or diatomaceous silica, tripoli, rotten stone, wood, fibre, etc. It was invented in 1866 by Alfred Nobel. The original dynamites varied from 75 per cent. of nitroglycerin and 25 per cent. of absorbent, down to 30 per cent. of nitroglycerin and 70 per cent. of absorbent, but 40 per cent. of nitroglycerin may be given as the average amount. In the United States the absorbent often is an aid to combustion, and consists of a mixture of wood-pulp and sodium nitrate, with small quantities of magnesium or sodium carbonate to neutralize any acid which may be present in the mixture. The product when thus formed is known as a "straight dynamite," but nitrates, charcoal, and wood fibre may be used for the absorbing material. Perhaps the most powerful form of dynamite is the explosive or blasting gelatin also invented by Nobel, in 1875, where pyroxylin or soluble cellulose nitrate is dissolved in nitroglycerin and a jelly-like mass produced. When this material is mixed with wood-pulp and potassium nitrate, the resulting product is known as gelatin dynamite. For commercial use the compound is made up in sticks or cartridges 8 inches in length and 1½ inches in diameter, which are usually packed in sawdust in boxes containing fifty pounds each. In the twelfth United States census the following table is given, showing the production of dynamite by decades in the United States:

Year	Number of establishments	Capital	Average number of wage earners	Product	
				Pounds	Value
1880	2	....	....	....	$622,671
1890	32	$3,929,503	731	30,626,738	4,253,032
1900	31	7,551,121	1,758	85,846,456	8,247,223

The production of dynamite in the United States in 1904 was about 130,000,000 pounds. See Explosives; Nitroglycerin.

DYNAMITE CRUISER. See Ordnance, *Classes of Cannon.*

DYNAMITE GUN. See Air Gun; Ordnance.

DYNAMO - ELECTRIC MACHINERY. Machinery in which mechanical energy is converted into electrical energy, or vice versa, by means of magnetic induction. According to this definition, every dynamo-electric machine is capable of serving either as a generator or as a motor, according to whether it is supplied with mechanical or electrical energy and whether it is, therefore, giving out electrical or mechanical energy, respectively. In an electric *generator* mechanical energy is converted into electrical energy by means of continuous relative motion between electrical conductors and a magnetic field, or fields, such motion causing the conductors to cut the lines of force of the fields. In an *electric motor* electrical energy is transformed into mechanical energy by means of continuously supplying a system of electrical conductors with an electric current, which causes a magnetic force to act between the conductors carrying it and the magnetic field, or fields, thereby producing continuous relative motion between the conductors and the magnetic fields.

The preceding definitions are general and necessarily technical. To comprehend them fully a knowledge of the fundamental principles involved in the operation of dynamo-electric machines is necessary. They may, however, be in a measure elucidated by a descriptive definition as follows: All generators consist essentially of one or more electro-magnets between the poles of which an armature, consisting of a soft iron core wound with coils of insulated copper wire, is made to revolve very rapidly by means of a steam-engine, a water-wheel, or other prime mover. The current produced in the generator may be transmitted by wires to any distance and there be converted into mechanical energy again by being made to pass through another machine, similar and often identical in construction, and there cause the armature to revolve, and this revolution may be employed to do any kind of mechanical work. This second machine, working in reverse order from the first, is an electric motor. This description makes it clear, as do the preceding definitions, that to understand thoroughly the dynamo-electric machine requires a knowledge of three great branches of science—magnetism, electricity, and mechanics. The necessity for this special knowledge makes the subject of dynamo-electric machines a difficult one to discuss in universally familiar terms. At best, therefore, only an indication of the structural details and operating principles involved is possible under such conditions.

FUNDAMENTAL PRINCIPLES. To understand the fundamental principles involved in the operation of dynamo-electric machines, consider first two magnetic poles, N and S, of opposite polarity placed near to each other, as in Fig. 1. Between the poles N and S is a field of magnetic force composed of so-called lines of magnetic force which may be pictorially indicated by parallel lines, as is done in the illustration. If a conductor, for example a round copper bar C, is placed in the magnetic field, with its axis horizontal and perpendicular to the lines of force, and is raised and lowered along the path C D so as to cut the lines of force, an electro-motive force is set up or induced in the conductor. The magnitude of the electro-motive force produced in the conductor depends upon the rate at which the lines of force are cut. Due to this electro-motive force, one end of the conductor is raised to a higher electric potential than the other, in consequence of which there is a tendency for electricity to flow along the conductor, and if its two ends are electrically connected exterior to the magnetic field so as to make a closed circuit, a current will flow through this circuit. If the gap between the poles N and S were infinite in extent in the direction C D, and if the conductor C in its motion along this infinite path were supplied with some sort of sliding contacts, so that a closed circuit would be maintained, the device would possess all the essential features of a generator or of a motor. An equivalent condition is secured (1) if the magnet is bent so that the N and S poles are opposite each other; (2) if the conductor C is arranged so as to rotate in the gap between the N and S poles as a radius pivoted on the common axis of N and S; and (3) if sliding contacts are provided at the centre of rotation and at the extremity of the conductor outside of the polar forces; the device then becomes a homopolar generator or motor.

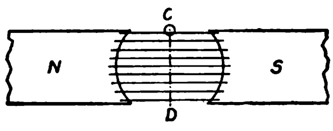


FIG. 1.

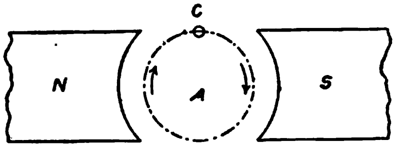
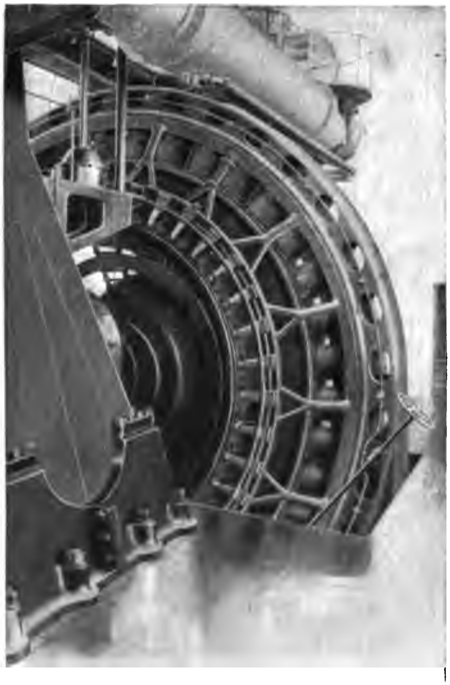
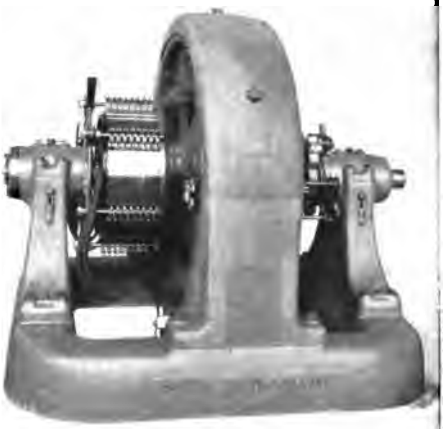


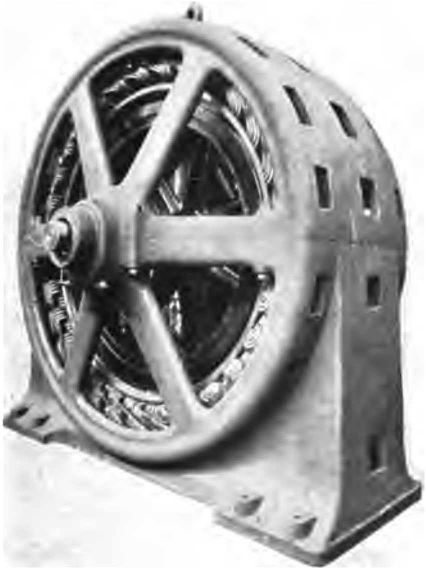
FIG. 2.

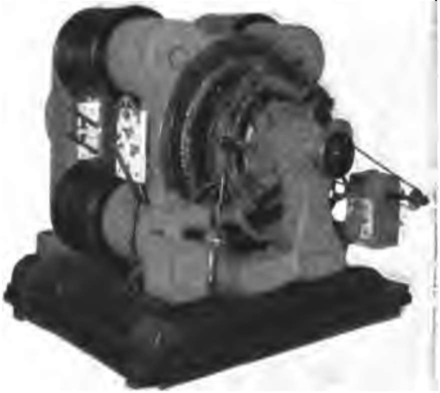
The form of machine just described is noteworthy chiefly because of its simplicity and the fact that it was the first form to be invented. All commercial machines now in use operate in such a manner that the conductor moves alternately forward and backward through the field of force. To illustrate, if the conductor C (Fig. 2) be attached to the circumference of a cylinder or other round body, which rotates about an axis A perpendicular to the paper, it will cut the lines of force by alternate downward and upward motions. An electro-motive force in one direction will be generated in the conductor C as it is going up and in the opposite direction as it is coming down. If the ends of C are brought down to the shaft A and formed into rings around it, brushes bearing on these rings, if connected to an external circuit, will receive an alternating current, that is, one which flows first in one direction, then in the opposite direction. Machines of this description are called *alternators;* the rotating part is called the armature; the pole pieces, N and S, with the remaining magnetic circuit, are called the field, and the rings around the shaft are called collector rings. If the current collected is to flow always in the same direction in the circuit which is external to the machine, some device must be provided to change automatically the connection between the armature circuit and the external circuit. Such a device is called a commutator. Its operation may be explained as follows: If in Fig. 2 the ends of the conductor C are brought down to the shaft A and extended across to the opposite side of the shaft, and then parallel to it so as to make the complete loop shown by Fig. 3, it will be obvious that the electro-motive forces generated in the

DYNAMO-ELECTRIC MACHINERY



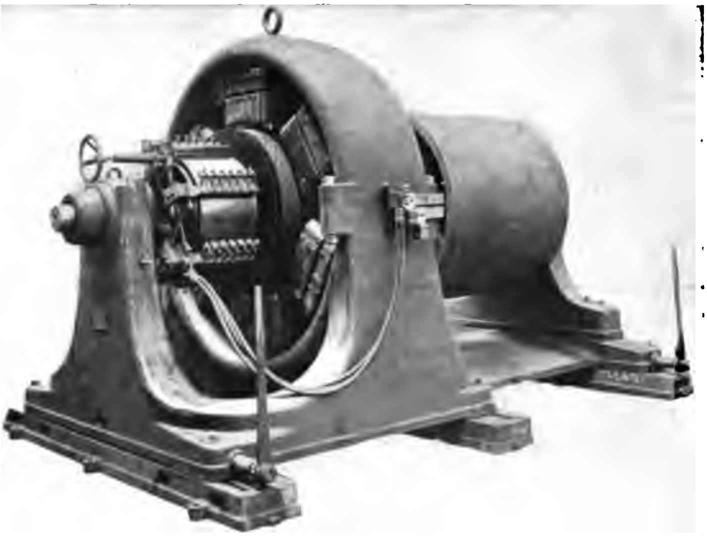


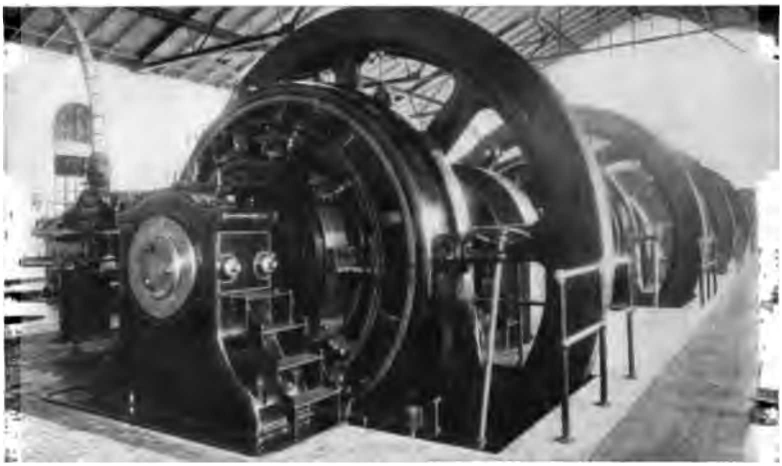


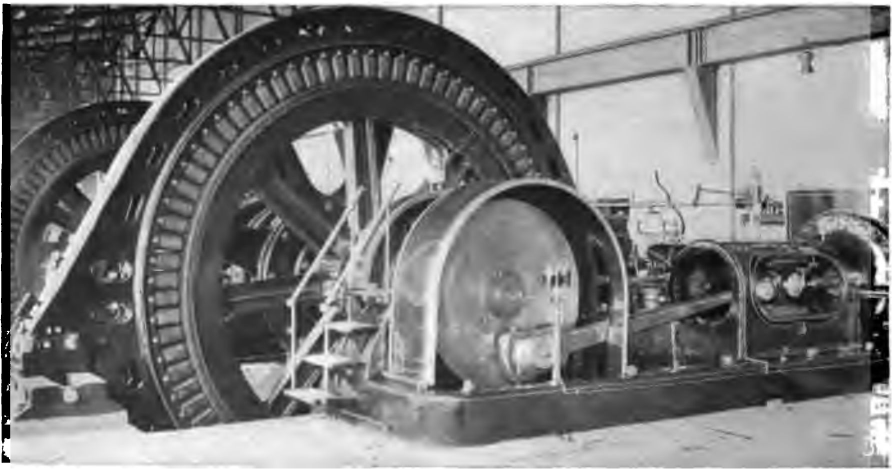


1. GENERAL ELECTRIC COMPANY, 2700 KILOWATT, 575 VOLT, RAILWAY GENERATOR.
2. GENERAL ELECTRIC COMPANY, 300 KILOWATT, SIX-POLE, THREE-PHASE, ROTARY CONVERTER
3. WESTINGHOUSE 850 HORSE POWER ALTERNATING CURRENT INDUCTION MOTOR.
4. WESTERN ELECTRIC COMPANY MULTIPLE CIRCUIT ARC LIGHTING DYNAMO.

DYNAMO-ELECTRIC MACHINERY







1. WESTINGHOUSE DIRECT CURRENT LIGHTING AND POWER GENERATOR, BELTED TYPE.

2. GROUP OF WESTINGHOUSE DIRECT CURRENT ENGINE-TYPE GENERATORS IN RAILWAY POWER HOUSE.

3. 750-KILOWATT WESTINGHOUSE ALTERNATING CURRENT ENGINE-TYPE GENERATOR.

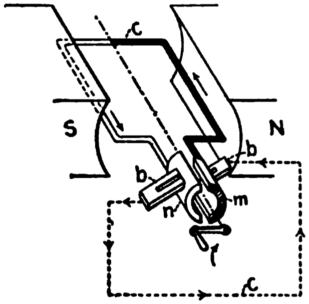


FIG. 3.

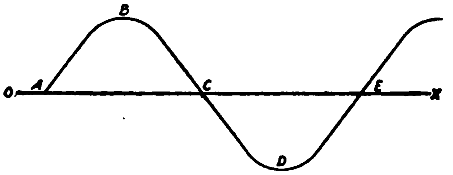


FIG. 4.

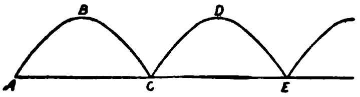


FIG. 5.

two sides of the loop will be opposite in absolute direction, as indicated by the arrows, but in the same direction as regards the conductor itself. If now the two ends *m* and *n* of the loop are attached to two half rings upon which brushes *b* and *b* composed of thin strips of metal or other conducting material rest, and these brushes are placed at such points that they pass from one half ring to the other at the same moment that the conductor C ceases cutting lines of force in one direction and commences to cut them in the other direction, the current in the external circuit *c* will always be in one direction. Machines of this description are called ***direct-current machines***. When the machine is operated as an alternator as first described, the direction and intensity of the current may be represented by the ordinates or vertical distances from the axis O X of the curved line A B C D in Fig. 4, of which the abscissæ or distances along the axis represent time. To illustrate, the distance A E represents the time of one complete revolution of the conductor. For half this time the current is in one direction represented by the curve above the axis and has an intensity rising from nothing at A to a maximum at B, and then falling to nothing at C. For the other half of this time the direction of the current is represented by the curve below the axis, and has an intensity increasing from nothing at C to a maximum at D and then decreasing to nothing again at E. When the machine is operated as a direct-current machine the current produced may be represented by the curve A B C D E in Fig. 5, of which the ordinates and abscissæ have the same significance as in the curve previously explained. It will be noted that the curve being always above the axis shows the current to flow always in one direction, but to fluctuate in intensity. This excessive fluctuation is due to the fact that there is but one rotating coil, as shown by Fig. 3. Were another coil at right angles to the first to be added to the armature, the maximum electro-motive forces in it would occur at the moments when there were no electro-motive forces acting in the first coil. Likewise if many coils are employed, the maximum electro-motive forces generated in the several coils will occur at different instants, and if these coils are so connected that their electro-motive forces are added to one another, the fluctuations will neutralize each other and the current obtained will be more uniform.

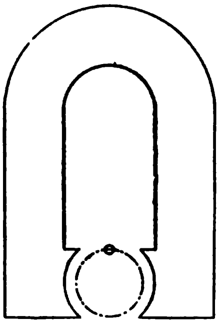


FIG. 6.

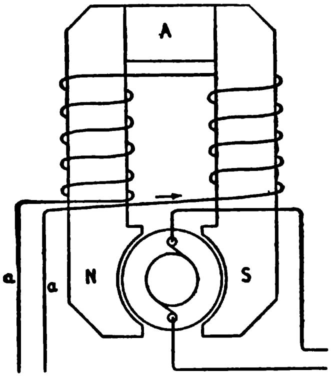


FIG. 7.

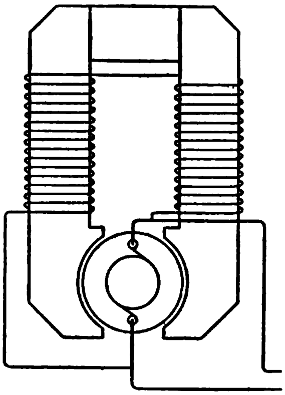


FIG. 8.

Thus far in this discussion it has been assumed that a magnetic field was already provided without inquiring in what manner it was provided. The manners in which such fields may be provided will now be described. In the earliest machines, and in some used even now for medical purposes and in the ringing magnets of telephones, the field is provided by a permanent magnet which may be of the form shown by Fig. 6. In all machines of any considerable size, however, the older form of permanent magnet is replaced by an electro-magnet. The method of producing such a magnet is indicated diagrammatically by Fig. 7, in which the cast-iron or steel yoke A is wound with a coil of wire, *a*, *a*. If a current flows through the winding in the direction indicated by the arrow, magnetic poles will be produced at N and S and a magnetic field will exist between them. The parts of the magnet may differ much in form and arrangement, but a magnetic circuit A N S interlinked or wound with an electric circuit (*a a*) is an essential feature. The electric current for exciting the field may be furnished from a source exterior to the generator or motor, or, in the case of a direct-

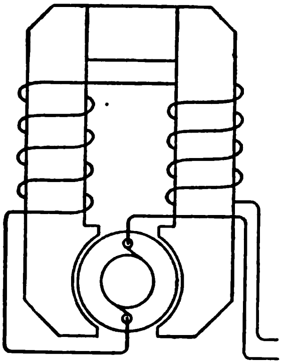


FIG. 9.

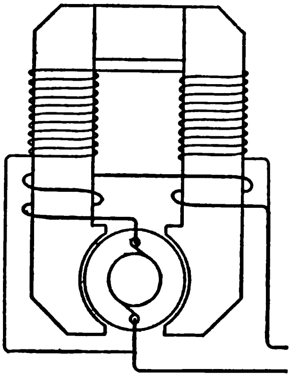


FIG. 10.

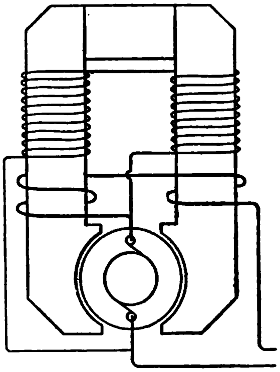


FIG. 11.

current dynamo, by the machine itself. There are two ways in which this self-excitation may be accomplished. If current is taken from the positive brush and led directly through the magnet-winding and back to the negative brush, as shown by Fig. 8, the magnet is in parallel or shunt with the external circuit, and the machine is called shunt-wound. In a shunt-wound machine only part of the current generated passes through the magnet-winding. If, however, all of the current coming from the armature passes through the field-magnet and then goes to the external circuit, as shown by Fig. 9, the machine is called series wound. If both shunt and series windings are employed, the machine is defined as compound wound. Compound windings are of two classes, defined as long shunt and short shunt. In the former the current used in the shunt windings is also passed through the series winding along with the main current, as shown by Fig. 10. In the latter the current from the shunt coils passes directly back to the armature, avoiding the series turns, as shown by Fig. 11. The field-magnets of alternators are excited by a current from a source exterior to the machine, usually from an auxiliary direct-current dynamo, called the exciter. The relative arrangement of the field-magnet winding and the exterior circuit in separately excited generators is shown by Fig. 7. The machines shown in these various diagrams, and in fact all the machines so far mentioned, have had but two magnetic poles. It is evident, however, that there may be as many pairs of poles as is desired, so long as the armature connections are arranged to correspond. Machines having only one pair of poles are called bipolar machines; machines having two or more pairs of poles are called multipolar. Most machines now built in the United States, except those of very small size, are multipolar machines, a typical form being shown in Fig. 12. There are usually as many brushes bearing on the commutator as there are field-poles, but this is not absolutely necessary, since the armature conductors may be so connected as to require only two brushes. The latter practice is followed in street-railway motors.

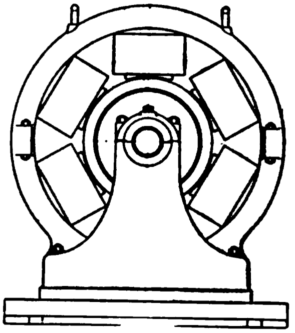
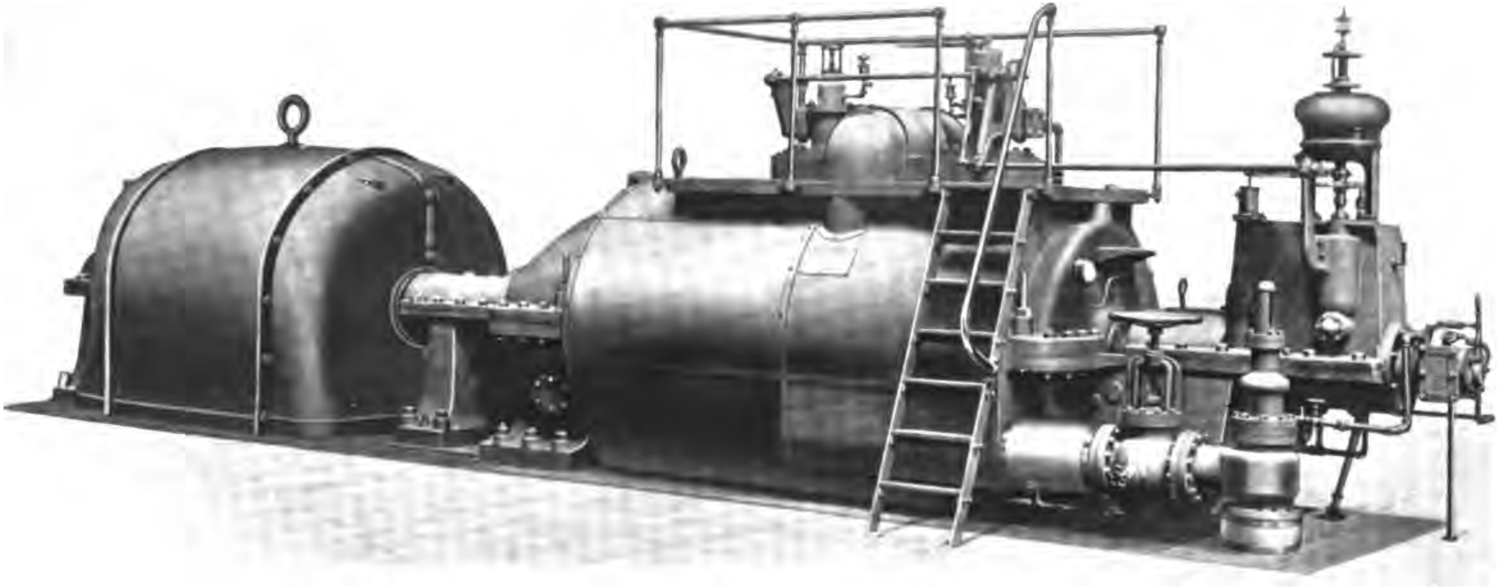


FIG. 12.

MATERIALS. The materials entering into the construction of the various parts of dynamo-electric machines are as follows: The magnetic circuit in the field is usually composed of cast iron or steel. The pole pieces may be of the same material as the field, or they may be composed of soft iron laminæ or sheets placed edge on to the shaft of the machine. In small and medium-sized machines the base and pillow blocks of the armature shaft are nearly always cast in one piece with the field. The body of the armature upon which the conductors are wound is always built up of iron laminæ placed edge on to the shaft. The object of using laminæ here and in the pole pieces is to prevent electric currents from flowing in the iron of the armature itself. Such currents would absorb power and needlessly heat the armature. The conductors themselves in both the field and the armature windings are copper wires or bars carefully insulated from the iron parts and from one another by cotton thread, or cloth, paper, cardboard, mica, etc. The commutator of direct-current machines is built up of copper segments separated by strips of mica. The brushes that bear upon the commutator in most modern machines take the form of blocks of carbon. In alternating-current machines there is no commutator, it being replaced by copper, brass, or iron rings.

HISTORICAL DEVELOPMENT. In the preceding paragraphs the several parts of dynamo-electric machines and the functions which they exercise have been described, and the attempt has been made to elucidate briefly and non-technically the principles at the basis of their operation. An account will now be given of their development, and afterwards the several types of machine in commercial use will be described.

The principle of electro-magnetic induction, upon which the operation of the dynamo-electric machine is based, was discovered by Michael Faraday in 1831. In his first experiments Faraday produced a current in a coil of wire by starting or stopping a current in a neighboring coil. He then generated currents in a coil by moving it before the poles of a magnet. His first electric motor was a homo-polar machine. A disk of copper was so mounted that it could rotate between the poles of a permanent magnet transversely to the direction of the lines of force. When a current was applied at the axis of the disk and led off at the periphery the disk rotated continuously. Faraday constructed a number of machines upon this principle, one of which con-



WESTINGHOUSE STEAM TURBINE GENERATOR UNIT

The Generator is shown on the left and the Turbine in the centre. The Turbine installation requires much less space and a less massive foundation than the ordinary Generator directly connected to a reciprocating Engine.

sisted of a copper hollow cylinder closed at one end and hung over and inclosing a bar magnet. The cylinder rested upon a vertical pivot at the closed end and the open end dipped into a cup of mercury. When a current was caused to traverse the cylinder lengthwise, the cylinder rotated continuously about the magnet. Faraday's next machine employed a rotating rectangle of wire like that shown in Fig. 3 above, except that no magnet was used such as is shown in the drawing. When the axis of the rectangle was placed east and west and the rectangle was rotated, alternating currents could be drawn from slip rings attached to the coil, or, by employing a commutator, direct current could be obtained. It will be noted that the only magnetic field employed was that of the earth. The first machine to give a continuous current was constructed by Sir Charles Wheatstone, an Englishman, in 1841. The armature of his machine was wound with six coils, each of which was connected to the brushes only at the instant when it was at its greatest activity. The use of electro-magnets instead of permanent magnets for the field was patented by Wheatstone and Cooke in 1845. A self-excited machine was constructed by Jacob Brett in 1848. The drum-wound armature in which the conductors are wound on the outside of an iron cylinder or drum was introduced by Werner Siemens at about the middle of the last century. At about the same time or a little later a type of armature constructed in an entirely different fashion was introduced by Gramme. Instead of winding the wires on the outside of a cylinder placed between the magnet poles, he wound them upon an iron ring. The Gramme-ring type of armature was at one time extensively used, but it has almost entirely disappeared from use at the present time. Designs of multipolar machines began to appear about 1880, and it was at about that time also that engineers began to study the principles entering into the design of dynamo-electric machines for commercial purposes. Since 1880 the greatest development has been in the direction of improving details of design and of mechanical construction.

Commercial Types. Turning now to the different types of dynamo-electric machines in use, it may be said in general that as they are now built in Europe and in America such machines differ in very few and in non-essential particulars. An exception to this statement may, however, be noted in the retention of bipolar designs and in the slowness in adapting polyphase machinery in England and also in the use of direct currents at high potentials for power transmission in Italy and France. Another variation from standard forms is presented by some of the machines built by Siemens & Halske, of Berlin, Germany, in which the armature is constructed in the form of a ring rotating outside of a 'spider' or star-shaped magnet frame. All of these exceptions are gradually disappearing from practice and need not be dwelt upon further. Only what may be called the standard types of dynamo-electric machines now in commercial use then remain for consideration.

Constant-current, direct-current machines were formerly much used for series arc lighting (see Electric Lighting). The essential feature of such a system is to maintain a constant current through the lamps, independent of the number of lamps in circuit, which of course necessitates a variation in pressure or voltage at the terminals of the dynamo. The required regulation of pressure in the old types of arc lighting machines was accomplished by an automatic shifting of the brushes, causing some of the coils to act in opposition to other coils, thus counteracting each other and reducing the voltage, or vice versa. In modern practice, the direct current series arc is seldom used, as the alternating current series arc lighting system possesses advantages of greater economy and simplicity of operation; in the latter system constant potential alternating current generators are universally employed, the required regulation of the current through the lamps being obtained by means of a constant current transformer. See Transformer.

By far the greater number of direct-current generators are constant potential machines, and are, if they are not separately excited, either shunt wound or compound wound. Generators of this type are used for supplying current for electric street railways, incandescent lighting, electrolytic work, and other purposes for which a direct current of comparatively low voltage is desired to be supplied at a constant potential irrespective of the load. In separately excited or shunt-wound machines the regulation of the current to constant potential is usually performed by inserting a rheostat or variable resistance in circuit with the field winding. By increasing or decreasing this resistance, usually by hand, the field current and, therefore, the electro-motive force, are decreased or increased. In compound-wound machines the regulation is accomplished as follows: When there is no load upon the generator the excitation of the magnets is produced entirely by the shunt winding, but as the load is increased the current flowing through the series coils aids that in the shunt coils, thus producing stronger fields and increasing the electro-motive force at the generator terminals. Small direct-current generators, whether operated at constant current or constant potential, are usually driven by belting from the engine or other prime motor, but large machines, in modern practice, are connected directly to the shaft of the prime motor. Typical direct-current constant-potential generators are shown on the adjoining pages.

The direct-current machine used as a motor will now be considered. If a dynamo-electric machine which has been connected for working as a generator be supplied with a current from an exterior source instead, it will run as a motor, the direction of the rotation depending upon the manner of the field excitation. A series machine, since both the armature and field currents are then reversed, will run in the opposite direction from that in which it was driven as a generator. A shunt-wound machine will rotate in the same direction when run as a motor as it did when driven as a generator, for, while the armature current is reversed, the field current remains unchanged in direction. A compound-wound machine will rotate in the same direction or in the opposite direction as a motor that it did as a generator, according as the shunt winding or the series winding is the more powerful; and while the field excitation as a generator was the sum of the series and the shunt windings, the field excitation as a motor is their difference. Another peculiarity of the dynamo-electric machine when operated as a motor which requires to be noted is that in such a machine operating as a generator there is only one electro-motive force acting, but in the same machine operating as a motor there are two electro-motive forces acting. The reason for this is that the armature of a motor revolving in a field under the influence of supplied electrical energy differs in no respect from the same armature revolving in a field under the influence of supplied mechanical energy: there is an electro-motive force induced in it exactly as is done in a generator. The direction of this induced electro-motive force is, however, such as to tend to send a current in a direction opposite to the current flowing under the influence of the external supply of electro-motive force. Therefore this pressure, which is induced in the armature of a motor, is called counter electro-motive force.

The current in the armature is due and proportional to the difference between the applied electro-motive force and the counter electro-motive force. The counter electro-motive force is proportional to the product of the speed of the conductor and the field strength. The torque, or twisting moment, of the armature is proportional to the product of armature current and field strength. It is evident that when the armature of a motor is at rest there is no counter electro-motive force acting, and that the highest speed it may reach is that at which the counter electro-motive force equals the applied electro-motive force. In starting up a motor an external resistance has therefore to be provided to take the place of the counter electro-motive force in order to keep down the current of the motor and prevent possible destructive action from it before the inertia of the armature has been overcome and rotation begun. This exterior resistance is commonly provided by a starting box or rheostat, which is a device by which the current is gradually applied. Destructive currents may also arise during operation from various causes, and to prevent damage from these, automatic attachments are often provided, which open the circuit and stop the current. To regulate the speed of motors rheostats operated by hand may be employed. When, however, it becomes necessary to vary the speed of a motor to any considerable degree, any of the rheostat methods introduce material losses of current, and to save these losses resort has to be made to other methods of regulation. It should be noted that a shunt motor when its armature is supplied with current at a constant potential runs at a practically constant speed, since the field strength is constant, and any diminution of speed would cause a great increase of current and torque. The speed may be varied by varying the applied electro-motive force, as above described, or by other means. The series motor has no proper speed or torque, since the field strength varies with the armature current, that is, for a varying load at the constant applied electro-motive force it has a varying speed and torque, the lighter the load the greater the speed and the less the current and torque. Use is made above of the term *torque*, and this perhaps requires some explanation before proceeding to consider specific forms of motors. When a street-railway motor, for example, is first thrown into circuit there is nothing but the resistance to limit the amount of current flowing, the result being that at first a powerful current flows through the armature and field coils. This produces a very intense field, which in turn exerts great force upon the armature. The effort to turn the armature, or twisting moment, is technically known as torque. The power of a motor is its torque multiplied by the number of revolutions.

Probably the form of motor which is used in the greatest numbers is the *direct-current street-railway motor*. A series-wound motor operating on a constant-potential circuit is universally used for street-railway work. These machines have to be unusually sturdy to withstand the conditions of service which require them to endure the shocks and jolts due to rough track, as well as the dust, mud, slush, and rain of storms and dirty streets, and often the abuse of ignorant or careless motormen. Street-railway motors, one of which is illustrated by Fig. 13, are usually constructed with four poles, but use only two commutator brushes, placed in such a position as to be easily accessible. The field frame which carries the poles is made of such shape as to inclose all the working parts and thus protect them from dirt and moisture.

It is general practice to equip each trolley car with at least two motors and to regulate the speed of the car in the following manner: First the two motors and a resistance are connected in series. The resistance is then cut out step by step until the two motors are operating in series on 500 volts. This is called a running connection. To increase the speed further, the motors are placed in parallel with a resistance in series with both. This resistance is then cut out step by step until the motors are each operating on 500 volts. This again constitutes a running connection. A further change is sometimes effected by placing a small resistance in shunt with the fields when all the series resistance is out. This reduces the field flux and causes a higher armature speed to maintain the necessary counter electro-motive force. A car governed in this way has four running connections. On heavy cars, such as are used in elevated-railway or interurban service, four motors are used on each car. In this case the motors are governed in two series-parallel combinations, as if there were two separate cars governed by one controller. The different connections are made by a motorman, who operates a handle on top of a controller. Each different combination is called a point or notch. A pointer fixed to the controller-handle indicates at what notch the car is running. A controller is almost invariably placed at each end of the car, and is familiar to every one as an upright cylindrical device with a crank-like handle on its top. The interior of an ordinary street-car controller is shown in Fig. 14. The wires from the trolley, from the field, from the armature, and from the different terminals of the series and shunt resistance are brought up under the car to terminals on a connecting board in the bottom of the controller. On this connecting board there is also a switch, which enables an injured motor to be cut out without interfering with the operation of the other. From the connecting board conductors are run to terminals called fingers or wipes. Mounted on an insulating cylinder, which may be revolved by the controller-handle, are insulated sectors, which at various angular positions of the cylinder make electrical connections between various wipes and give the proper connections for the various points or notches. A smaller cylinder connected to a reversing-lever is situated to the right of the main cylinder. This has contact sectors which are arranged so as to enable the motorman to reverse the direction of rotation of both motors or to cut them out entirely.

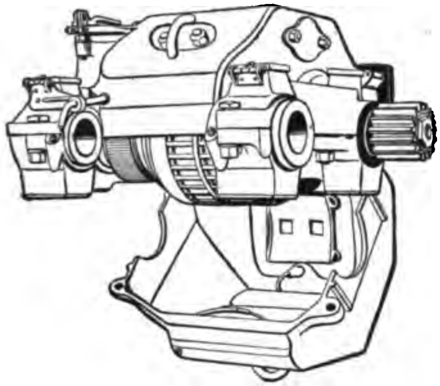


FIG. 13. RAILWAY MOTOR (G. E. FORM).
Lower frame dropped showing armature in position.

For power distribution in factories both series and shunt motors are used. The series motor is employed where a powerful starting effort is required, as on cranes and hoists, but where close speed regulation is unimportant. The speed of the shunt motor may be controlled by controlling the applied electro-motive force, as explained above, and the shunt motor is thus especially adapted for driving machines at constant speed. The characteristics of the compound-wound motor are intermediate between those of the shunt and series motors.

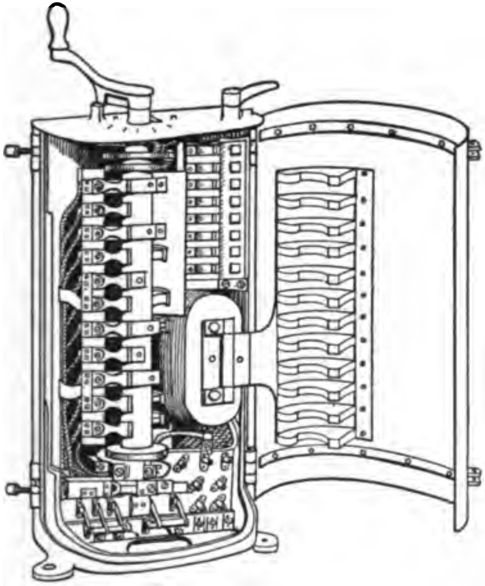


FIG. 14. CONTROLLER.

CONVERTERS, DYNAMOTORS, BOOSTERS, ETC. Before passing to the subject of alternating machines proper, some types of machines possessing certain special properties which make them extremely useful devices under certain circumstances will be briefly considered. If the armature winding of any direct-current dynamo be tapped at two points which are opposite in phase, that is, represented by a distance equal to that between two consecutive field-poles, and these taps are led to two slip rings upon the shaft of the machine, alternating currents may be drawn therefrom. If the machine be run as a motor by supplying it with direct current delivered to the direct-current brushes, then alternating currents may be drawn from the slip rings. If, after the machine is brought up to full speed, alternating current of the same periodicity, or the same number of alternations per minute, as the machine will produce when run as a generator at this speed, be supplied to the slip rings, it will run as a synchronous motor, and direct current can be drawn from the regular direct-current brushes. To summarize, then, by simply tapping the armature winding of a direct-current dynamo in the manner described, a machine is produced which will act as an alternating-current generator as well; which will transform direct current into alternating, and which will also transform alternating current into direct current. According as the machine is used for the first, second, or third of these purposes it is called a double-current generator, an inverted converter, or a rotary converter. These machines are most commonly employed to transform alternating current into direct current, and are commonly termed *rotary converters*. One of the principal uses of rotary converters is in electric-railway operation, where the distance of transmission is great. For long-distance transmission alternating current is desirable, since it may be raised easily to a higher potential, as will be explained below. The current for operating the car-motors is usually, however, direct current, so that when energy is transmitted in the form of alternating currents, rotary-converter substations are placed at intervals along the line to convert the alternating current to direct current for distribution to the trolley-line. A *dynamotor* is a transforming device combining both motor and generator action in one magnetic field by employing two armatures or one armature having two separate windings. These machines enable one to take direct current from a system of supply at one voltage and deliver it at another voltage to a circuit in which it is to be utilized. They are used in electroplating works and for various minor purposes. *Motor generators* are transforming devices consisting of two machines, a motor and generator, mechanically connected. A *booster* is a machine inserted in series in a circuit to change its voltage, and may be driven by an electric motor or otherwise. Boosters are used extensively in street-railway systems.

ALTERNATING-CURRENT MACHINES. Dynamo-electric machines for generating alternating current have been mentioned several times in the preceding pages. Before proceeding to discuss this type of dynamo, it will be desirable to define the terms "single phase," "two-phase," and "three-phase," which will be frequently used in this discussion. All the alternators so far mentioned have been single-phase machines. If in Fig. 3 slip rings had been substituted for the commutator, the armature winding there shown would deliver a current which would reverse twice during each revolution of the armature. If another winding be added, the position of which on the armature is at right angles to the first, and this winding be also provided with slip rings, it will likewise deliver an alternating current which will be of the same periodicity as that delivered by the first. It is evident, however, that the current in the second winding will come to its maximum value one-quarter period later than in the case of the first winding. The currents in the two windings are said to differ in phase by a quarter of a period and the machine is spoken of as a quarter-phase or two-phase machine. If the values of the currents are plotted as ordinates (verticals) in a diagram where the abscissæ (horizontals) represent time, the curves produced will be like those shown in Fig. 15, where the distance from *a* to *b* represents the time of one revolution, or two alternations, and the distance from *a* to *e* represents one-quarter of a revolution, or the time elapsing between the instant when the current in the first winding is zero to the instant when the current in the second winding is zero. If about the circumference of the armature there were three wires spaced at equal distances, and these wires were connected at a common junction at one end of the armature and to three separate slip rings at the other end, the currents flowing in the three wires would reach their maximum at periods one-third of a revolution from each other, and the resulting curve diagram would be as shown by Fig 16. To apply the explanation given above to multipolar machines, the terms "complete revolution" and "circumference of the armature" should be understood to mean time taken by a conductor to pass by two poles and space upon the armature covered by two poles. Also, while the explanation considers only alternating machines which have stationary fields and rotating armatures, it is evident that the rotative mobility of the two may be reversed. In fact, in most large machines directly connected to the prime motor, the field is the rotating part. In the inductor alternator both the field winding and the armature are stationary, the only revolving part being the inductor—a laminated iron core with polar projections.

The so-called "turbo-generator" is a type of dynamo-electric machine that merits particular mention, as it is becoming more and more extensively used, especially for large alternating current generators. The lower limit to the size of a generator for a given output is fixed by the maximum speed for which the prime mover can be designed,—at least this is true if the generator is directly connected to the engine shaft, and for large units this is the only practical way. The speed of a reciprocating engine of high power must necessarily be slow, and in consequence the size of the generator soon becomes prohibitive, both on account of the difficulties of construction and the space which the finished machine occupies. However, these difficulties are overcome by employing a steam turbine (q.v.) as the prime mover. The characteristic feature of such a machine is that it must be run at exceedingly high speeds, and in consequence the connected generators must be designed to withstand the enormous strains resulting from this high rotative speed. This is accomplished by making the revolving part as small in diameter as feasible and using in its construction only the very strongest material; in case of alternating current turbo-generators the revolving part is invariably the field, the core of which is usually made of nickel-steel and the field winding of insulated copper strap held in place by bars of phosphor-bronze.

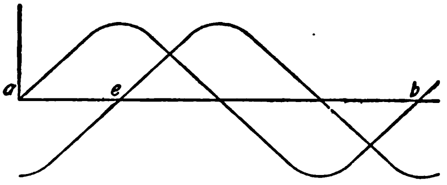


FIG. 15.

Alternating-current motors may be classed as *synchronous* and as *non-synchronous*. The rotary converter above described represents quite well the first class. Such motors are not in extensive use, on account of the fact that they must be brought up to full speed before they can be thrown into circuit. They, of course, run at the same speed as, or keep in step with, the generator which is furnishing the current. Non-synchronous motors are of two kinds, the induction motor and the recently developed alternating current commutating motor. In order to explain the induction motor an interesting property of polyphase or multiphase current must be described. In Fig. 17 is shown, diagrammatically, a four-pole electromagnet. If a current is sent through the coils on the two poles A and A′ there will be established a magnetic field across from A to A′ in the direction of the arrow No. 1. Similarly, if a current is sent around B and B′ a magnetic field will be established across from B to B′ in the direction of arrow No. 2. If both currents are flowing at the same time and are of equal strength, the resultant field will be in the direction of arrow No. 3. Now, if the A current and the B current are alternating and differ in phase 90°, i.e., if the A current has its maximum value when the B current is zero, and vice versa, then starting with the A current at its maximum the magnetic field between the poles will at first be in the direction of arrow No. 1, then as the B current increases and the A current decreases the field will change in direction, until when the A and B currents are equal it will be in the direction of arrow No. 3; as the A current continues to decrease to zero and the B current to increase to its maximum, the direction of the field will change into that of arrow No. 2; then as the A current takes a negative value and the B current decreases from its maximum, the field will continue to change its direction, until, for a complete cycle of either the A or B current, the field will have taken all possible directions, about the point O, in other words, the magnetic field will rotate with a

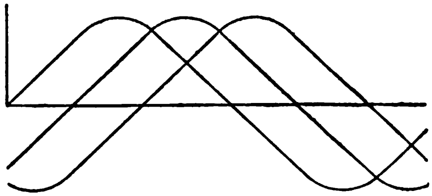


FIG. 16.

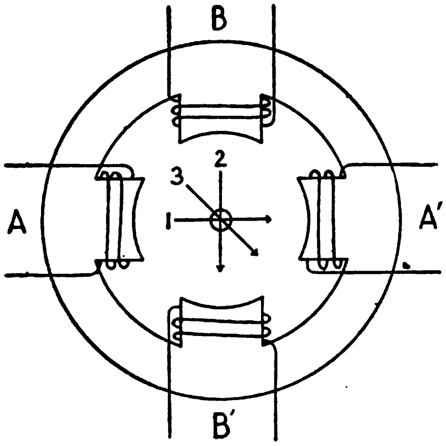


Fig. 17.

period of revolution equal to the period of the current. If then an armature is mounted between the poles, and this armature is provided with a winding which is short-circuited upon itself, the moving magnetic field will induce currents in this winding. These currents will in turn set up a second rotating field tending to oppose the rotating field due to the fixed coils AA′ and BB′, and the pull between the two fields will cause the armature to revolve. Such a device is called an induction motor. In actual practice the field or stator of an induction motor is provided with a so-called distributed winding similar to that on the armature of a direct-current motor, so that there are no polar projections as shown in the figure, but the effect of this winding is equivalent to that of the simple winding discussed. It will be obvious that three-phase currents could be used as well as two-phase currents. Single-phase induction motors are also made in small sizes, but the principle according to which they operate is somewhat more intricate than that governing polyphase motors. Polyphase-induction motors are capable of being used for practically all the purposes to which shunt wound direct-current motors are applied, and with proper controlling appliances may be used with more or less success in place of the series direct-current motors. They are simple in construction, have no moving contacts, and do not easily get out of order. They have been extensively employed in mills and factories, and in Europe they are used to propel electric-railway cars. Induction motors vary greatly in construction; the simple induction motor, however, is essentially a constant-speed machine.

The development of the alternating current *single-phase series motor* is the result of the demand for an economical traction system for long distance and heavy railway work. The transmission of large amounts of electrical energy for any considerable distance can be economically accomplished only by means of alternating currents. (See Transmission of Power.) If direct-current motors are used, this energy has to be transformed by means of static transformers and rotary converters into direct current at a comparatively low pressure, and this low pressure direct-current energy transmitted from the transforming station to the motor. The advantages resulting from the employment of a suitable alternating current motor are the elimination of the rotary converters and their attendant expenses, and an increased efficiency in the secondary transmission, as the final reduction of pressure to the value required at the motor can be accomplished by means of a small transformer carried on the car. Neither the synchronous nor induction motor is suitable for this purpose, for neither of them possesses the two essential features of a traction motor: large tractive force at starting and high efficiency over a wide range of speed. The three-phase induction motor is employed to some extent abroad, but this system has never been attempted in the United States, the American engineers having devoted their attention to the perfecting of a single-phase railway motor possessing characteristics somewhat similar to those of the direct-current series motor.

An ordinary direct-current series motor will run on an alternating circuit, since the direction of rotation is independent of the direction in which the current passes through the motor (a direct-current motor can be reversed only by changing the connection of the field and armature leads relative to each other), but at a great reduction in efficiency and power-factor, due to certain peculiarities of alternating currents of too technical a nature to enter into here. However, these difficulties can be largely overcome by suitably proportioning the various parts of the machine. Two distinct types of single-phase motors have thus been developed, the "series" motor and the "repulsion" motor. Both these types are alike in having an armature essentially similar in construction to that of the direct-current series motor. In the series type the field winding is similar to that of a direct-current machine, except that the iron used in the poles and yokes is laminated; the field and armature are connected in series. In the "repulsion" motor the field is similar to that of an induction motor; the brushes are short-circuited, and there is no electrical connection between field and armature. The armature acts like the secondary of a static transformer, and the brushes are set so as to maintain a constant repulsion between the primary (field) and the secondary (armature).

The controlling system for alternating current motors contains no resistance, the necessary variations in pressure to secure a uniform acceleration at starting being accomplished by means of a device called a potential regulator, which is essentially a static transformer with its coils movable with respect to each other. The high efficiency of the inductor regulator increases the commercial value of this system, as its energy consumption is quite low compared with the direct-current system in which a large amount of energy is lost in the controlling resistance.

For long-distance power transmission alternating currents are used almost exclusively, as a large alternating current of low potential may be converted into a small current of high potential by a transformer (q.v.) (see Transformers), and by this means a great saving in the copper required in the transmission line may be accomplished. At the distant end of the line another transformation may be used to "step down" or reconvert the current to one of low potential. For long-distance transmission work three-phase currents are peculiarly adapted, as a three-phase current of a given potential may be transmitted with only three-fourths of the copper required for a single-phase, two-phase, or direct current working at the same pressure between wires. See Power, Transmission of.

Consult the following books: Thompson, *Dynamo-Electric Machinery* (London, 1904); Sheldon, *Dynamo-Electric Machinery:* vol. i., *Direct Current Machines* (New York, 1904); vol. ii., *Alternating Current Machines* (New York, 1904); Oudin, *Standard Polyphase Apparatus and Systems* (New York, 1904); Ashe and Keiley, *Electric Railways* (New York, 1905). For the engineer: Wiener, *Practical Calculation of Dynamo-Electric Machines* (New York, 1902); Jackson, *Electro-Magnetism and the Construction of Dynamos* (New York, 1903); Foster, *Electrical Engineers' Pocket Book* (New York, 1906); Steinmetz, *Elements of Theoretical Electrical Engineering* (New York, 1900); Raymond, *Alternating Current Engineering* (New York, 1905).

DY′NAMOM′ETER (from Gk. *δύναμις*, *dynamis*, power + *μέτρον*, *metron*, measure). A device for measuring the force exerted in overcoming resistance and producing motion. The foot-pound, as a unit of work, has for its factors the force acting and the distance through which it acts. The horse-power, besides these factors, has a third—the time during which the force is exerted. Hence, in getting the data from which the work of a machine is to be calculated, we are to observe the force, the distance, and the time required to accomplish a certain result. Strictly speaking, the dynamometer indicates the first of these items, but it may be so arranged as to show both the others. Dynamometers are designed to indicate the force of *traction*, of *thrust*, or of *rotation*. A traction dynamometer consisting of some sort of spring balance may be interposed, for example, between a team of horses and a reaper or a plow, to measure the force exerted by the horses in drawing the machine. A dynamometer for thrust can be connected with the screw shaft of a steamship to measure the force with which the screw is driving the vessel through the water. Rotary dynamometers measure the force of a shaft either by showing what force is required to hold the shaft in check, by absorbing the *energy*, or by ascertaining the force the shaft transmits to other machinery. The Prony brake is the most commonly used dynamometer of this form and is found described, with directions for using it, in Kent's *Mechanical Engineer's Pocket-book*. See also Carpenter's *Experimental Engineering*.

DY′NAMO′TOR. See Dynamo-Electric Machinery.

DYNE, dīn (abbreviated from *dynam*, from Gk. *δύναμις*, *dynamis*, power). The unit of force of the C. G. S. system—that is, it is such a force that under its action a body of mass 1 gram is given an acceleration unity. Bodies of all masses fall toward the earth with the same acceleration at any one place on the earth's surface, provided they are allowed to fall perfectly freely. (See Gravitation.) This acceleration for all places is about 980 on the C. G. S. system; therefore, the *weight* of a body whose mass is *m* grams—i.e. the force of the earth acting on it, being the product of *m* and this acceleration of a falling body, is 980 *m* dynes approximately. The weight of one milligram is, then, 0.980 dynes, or nearly one dyne. Since a dyne is so small, a more common unit of force is a 'megadyne,' or 1,000,000 dynes—i. e. 10^6 dynes. See Mechanical Units; Force.

DY′RENFORTH, Robert Saint George (1844—). An American soldier and lawyer, born in Chicago. He graduated at Breslau in 1861, served in the United States Army in 1861-66, became major of volunteer cavalry, assistant inspector-general and signal officer in the Department of the Missouri, and was several times brevetted. In 1866 he was correspondent of the Chicago *Post* and *Times* during the war between Austria and Prussia. He entered the United States Patent Office in 1871, was examiner-in-chief during the administration of President Hayes, and assistant commissioner during that of President Arthur. He resigned in 1885, and began practice as a patent and corporation lawyer. He was elected commander of the Military Order of Merit, and commander-in-chief of the Union Veterans' Union. In 1891 he carried on in Texas a series of experiments for the Government, to show that by violent explosions water-vapor might be condensed into rain. Dyrenforth was, in consequence, popularly known as the 'Rain-Maker.'

DYRRHACHIUM, dĭr-rā′kĭ-ŭm. See Durazzo.

DYSCHROMATOPSIA, dĭs′krō-mȧ-tŏp′sĭ-ȧ. Difficulty in distinguishing colors, or partial color-blindness.

DYSENTERY (Lat. *dysenteria*, Gk. *δυσεντερία*, *dysenteria*, dysentery, from *δυσ-*, *dys-*, bad + *ἔντερον*, *enteron*, intestine). A form of disease of the large, rarely also in the small, intestine, attended by frequent and scanty discharges from the bowels, and differing from diarrhœa (q.v.) chiefly in being attended by marked fever and pain, as also by the presence of blood and mucus in the discharges. Two forms of dysentery are recognized by medical authorities—sporadic and epidemic. In *acute catarrhal colitis* an increase in mucus occurs, which is thrown off with epithelial cells, serum, and blood, ulceration occurring, with swelling of the glands and formation of connective tissue. This is the ordinary form of dysentery, which is relieved by saline purgatives, astringent injections, opium, salol, and enemata of starch or hot water. *Acute infectious colitis*, or 'tropical dysentery,' is either caused by the presence of the *Amœba coli* ('amœbic colitis') or by the presence of *Bacillus pyocyaneus*, as shown by Shiga in 1897 and Flexner in 1899. In tropical dysentery, necrotic and suppurative processes may be set up in the liver and in the right lung. The symptoms are largely the same as in catarrhal colitis, except that they are more severe; the mortality also is high. Tropical dysentery is rarely seen in emigrants coming to the United States. It is endemic in southern Europe. There is a chronic catarrhal colitis. There is also a form of dysentery, known as 'croupous colitis,' in which there occurs formation of a false membrane over the mucous lining of the intestine. To the variety of dysentery in which inflammatory changes are the most marked in the lymph-nodes, the name *nodular* or *follicular* dysentery is given. If necrosis of the mucous membrane be extensive, the colitis is termed *necrotic*. All cases of dysentery which do not improve under milk or peptonoid diet and injections of starch and hot water should be speedily put into a physician's hands.

DYS′LYSIN (from Gk. *δυσ-*, *dys-*, hard + *λυσινός*, **lysinos*, soluble, from *λύειν*, *lyein*, to solve), $C_{24}H_{36}O_3$. An organic substance obtained by boiling cholic acid with hydrochloric acid for some time. It is a neutral resinous body, insoluble in water, alcohol, and the alkalies, but moderately soluble in ether. Small quantities of it are sometimes found in fæces.

DYSMENORRHŒA, dĭs′mĕn-ŏr-rē′å. See MENSTRUATION.

DYSPEPSIA (Lat. *dyspepsia*, Gk. *δυσπεψία*, *dyspepsia*, from *δυσ-*, *dys-*, bad + *πεπτός*, *peptos*, cooked, from *πέπτειν*, *peptein*, to cook). Disordered function of the stomach, resulting in impaired digestion. The symptoms are: Feeling of pressure or weight after a meal, burning (*pyrosis*), accumulation of gas, headache, coated tongue, drowsiness, and general weakness and discomfort. There may be a diseased condition of the mucous membrane of the stomach (*gastritis*), with pain and vomiting in addition to the symptoms noted; there may be a deficiency in the hydrochloric and lactic acids in the gastric juice; there may be excessive production of these acids; there may be a rapid fermentation of the food, with the production of gas and toxins, causing great pain in the stomach, severe headache, palpitation of the heart, and frequent raising of gas, this condition being termed flatulent dyspepsia. There may be a general nervous condition, with waste of nerve energy, the stomach being the first organ to fail in its functions; this condition being termed nervous dyspepsia. Gout, or lithemia, may be a cause of dyspepsia. In many cases constipation is also a symptom, and the use of cathartics has made the dyspepsia worse. Treatment must be directed to the cause, and in all cases diet must be regulated and daily out-of-door exercise practiced. Indigestion or irritating food should be avoided, such as smoked or salted meat, smoked or salted fish, hot breads, all fried articles of food, generally potatoes and roots, sweets, pastry, and oatmeal. Tea and coffee and all alcoholic liquors should be avoided, in general. Food should be thoroughly masticated and eaten slowly. In some cases the stomach should be washed out every day or two. Bitter tonics, such as strychnine, are helpful, also creosote, carbolic acid, kola, ginger, and various digestants, such as pepsin and papoid, in certain cases. Management is better than medicinal treatment in many cases.

DYSPHO′NIA (Neo-Lat., from Gk. *δυσφωνία*, harshness of sound, from *δυσ-*, *dys-*, bad + *φωνή*, *phōnē*, voice, from *φάναι*, *phanai*, to speak). Difficult speaking. It is attended with inflammation, huskiness, cough, expectoration, and sometimes ulceration. Rest of the vocal organs, muscular exercise, tonics, and change of air and scene, are helpful toward recovery. *Dysphonia clericorum*, or 'clergyman's sore throat,' is a glandular laryngitis arising from the forcible and improper use of the voice one day in seven. Daily vocal exercise is desirable in such cases. *Dysphonia puberum* is the term given to the changing voice at puberty, when it becomes harsh and inharmonious, and 'breaks' when used. *Dysphonia spastica*, or 'speaker's cramp,' is a spasm of the muscles of phonation or respiration. In this variety of dysphonia there are sudden changes to a high pitch, the voice becomes jerky, or aphonia occurs.

DYSTE′LEOL′OGY (from Gk. *δυσ-*, *dys-*, bad + *τέλος*, *telos*, end + *-λογία*, *-logia*, account, from *λέγειν*, *legein*, to say). The doctrine of purposelessness, or of the absence of final causes in nature. The term is sometimes used in the sense of frustration of purpose, as when cross-pollination in plants is prevented because an insect punctures a nectary instead of entering the floral opening. See TELEOLOGY.

DYSU′RIA (Lat., from Gk. *δυσουρία*, *dysouria*, dysuria, from *δυσ-*, *dys-*, bad + *οὖρον*, *ouron*, urine). A difficulty of passing urine, which may depend on a variety of causes. See BLADDER; STRICTURE.

DYTISCIDÆ, dĭ-tĭs′ĭ-dē. See DIVING BEETLE.

DYVEKE, dṳ′ve-kå (1491-1517). The mistress of Christian II. of Denmark. She was born in Amsterdam, the daughter of Sigbrit Willums, an inn-keeper, in whose inn at Bergen Christian first met her daughter. Dyveke followed him to Denmark in 1507, and until her death continued her relations with him. She was hated by the nobles, and, it is supposed, met her death by poison administered to her in cherries by one of them. Christian cruelly avenged her death, and retained her mother as his chief counselor till his fall. Dyveke has been made the subject of many tragedies, novels, and poems. Consult: Hauch, *Wilhelm Zabern* (Copenhagen, 1848); and Reikhoff, *Düveke*, a tragedy (Berlin, 1843).

DZEREN, dzē′rĕn. The Mongolian name for a large Central Asian 'goitred' antelope (*Gazella gutturosa*), having extremely pale horns and a protruding crop.

DZIATZKO, dzē-äts′kō, KARL FRANZ OTTO (1842-1903). A German librarian and author, born at Neustadt, Silesia. He studied at the universities of Breslau and Bonn, in 1872 became librarian of the former, and in 1886 librarian and professor of library science at Göttingen. Among his publications are a text edition of the comedies of Terence (1884), *Instruktion für die Ordnung der Titel im alphabetischen Zettelkatalog der königlichen und Universitätsbibliothek zu Breslau* (1886), used, with comparison of other works, as the basis of K. A. Linderfelt's *Eclectic Card Catalog Rules* (Boston, 1890), and *Untersuchungen über ausgewählte Kapitel des antiken Buchwesens* (1900).

DZIERZON, dzēr′tsōn, JOHANN (1811—). A German apiculturist. He was born at Lowkowitz, Upper Silesia, studied theology at Breslau, and was pastor at Karlsmarkt from 1835 to 1869. Afterwards he devoted himself entirely to apiculture, a subject to which he had for many years given considerable attention. In order to facilitate his investigations, Dzierzon constructed a hive with detachable cells, and thus made the discovery that the eggs for the propagation of the drones required no fertilization, but could be generated by the queens, or even by the working bees. (See PARTHENOGENESIS.) His publications include *Theorie und Praxis des neuen Bienenfreundes* (1848), and *Rationelle Bienenzucht* (2d ed. 1878).

DZIGGETAI, dzĭg′ge-tä *or* -tī, or DJIGGETAI. Mongol names of one form of the Asiatic wild ass. See ASS.

DZUNGARIA, dzōōṇ-gä′rē-å. See SUNGARIA.

E

E The fifth letter and second vowel in the Roman and most other alphabets. Its form is derived from the Phœnician sign ϸ through the Greek and Roman scripts. The Semitic name for this character, *he*, is not a word with recognized signification, as is the case with most of the other letters. See ALPHABET; LETTERS.

PHONETIC CHARACTER. The Greeks had two characters to represent the short and the long sound of our *e* in *let* and *they*. The short one, *ε*, was called *epsilon;* the long one, *η*, was designated as *eta*. In Latin also there were both a short and a long *e*, just as there were in primitive Indo-Germanic. In Sanskrit the sound of *e* was long, but it was shortened under certain circumstances in Pāli and in the vernaculars. Historically, the Indo-Germanic short *è* becomes *ǎ* in Sanskrit, *ĕ* in Greek and Latin, as in Idg. **bhérō*, 'I bear,' Skt. *bhárāmi*, Gk. *φέρω*, Lat. *fero*. The original long *ē* becomes Skt. *ā*, Gk. *η*, Lat. *ē;* thus, Idg. **plē*, 'fill,' Skt. *prā-ta*, 'full,' Gk. *πλή-ρης*, Lat. *plē-nus*. In English, the single character *e* is used to represent a variety of sounds—*get*, *he*, *her*, *there*, and the like—and its employment to indicate that the preceding vowel is long, as in *ston*(*e*), from AS. *stān*, is a device inherited from an earlier period of misspelling in the language. The frequency of *e* in English is largely due historically to its being the indiscriminate or indefinite vowel into which the final endings *a*, *o*, *u* of the Anglo-Saxon period were weakened. The case in German is somewhat similar. In Romance words also the mute *e* usually takes the place of Greek or Latin final syllables—e.g. mus*e*, Lat. mus*a;* bil*e*, Lat. bil*is;* con*e*, Lat. con*us*.

AS A SYMBOL. *E* in music is the third tone in the natural scale of C; in the treble clef it is written on the first line or fourth space, and in the third space or the first added line below in the bass clef. As an abbreviation E. stands for East.

EA-BANI, ā'à-bä'nê. A character in the Babylonian Izdubar legends, represented as half man, half bull. Aided by his prowess and strength, Izdubar slays Khumbaba the Elamite, who has usurped the throne of Erech. But Izdubar has scorned the love of the goddess Ishtar, who in revenge inflicts leprosy upon him, and puts Ea-bani to death. He is brought back to life by the prayers and intercession of Izdubar. See GILGAMESH.

EACHARD, ĕch'ẽrd, JOHN (1636-97). An English clergyman and writer. He was educated at Cambridge, where he became master of Catherine Hall, and for two terms was vice-chancellor of the university. He published a number of satirical attacks upon the clergy, among them *The Ground and Occasions of the Contempt of the Clergy Inquired Into, in a Letter to R. L.* (1670). In a similar vein of satire he attacked the philosophy of Thomas Hobbes in *Mr. Hobbes's State of Nature Considered* (1672).

EADIE, ē'dĭ, JOHN (1810-76). A Scottish United Presbyterian theologian, born at Alva, Stirlingshire, and educated at the University of Glasgow and in the Divinity Hall of the United Secession Church. He was licensed in 1835, and preached in Glasgow till his death, June 3, 1876, from 1863, as pastor of the Lansdowne Church. From 1843 he was a synodical professor of biblical literature in the United Secession Divinity Hall in Glasgow, and his fame rests upon his writings in this department, all of which were scholarly yet popular. Many had a very wide sale and are still in use, as his condensed edition of *Cruden's Concordance* (1839); *Biblical Cyclopædia* (1848; new ed., revised, 1902); *An Analytical Concordance to the Holy Scriptures* (1856); and *Ecclesiastical Encyclopædia* (1861). He prepared commentaries upon the Greek text of Ephesians (1854), Colossians (1856), Philippians (1857), Galatians (1869), I. Thessalonians (1877). He was a member of the New Testament Company of the Bible Revision Committee, and in that connection published his important and interesting work, *The English Bible: An External and Critical History of Various English Translations of Scripture, with Remarks on the Need of Revising the English New Testament* (1876). He collected a remarkable library, which is now kept intact as the Eadie Library in the United Presbyterian College in Glasgow. For his *Life*, consult Brown (London, 1878).

EADMER (ĕd'mẽr) **OF CANTERBURY** (?-1124). An English monk and chronicler of the early twelfth century. He belonged to the Benedictine monastery at Canterbury, and was a devoted friend of Anselm, Archbishop of Canterbury, from 1093 to 1109. In 1120, at the request of King Alexander I., he went to Scotland, and was chosen Bishop of Saint Andrews. The question of lay investiture of ecclesiastical benefices was then a burning one, and there were controversies as to jurisdiction between Saint Andrews, Canterbury, and York. The outcome was that Eadmer returned to England unconsecrated. He became precentor of Canterbury, and died, it is supposed, in January, 1124. His most valuable works are the *Historia Novorum*, or history of his own times, and his life of Anselm. They are both in the same volume of the Rolls Series (London, 1884), edited by Martin Rule. Consult Grub, *Ecclesiastical History of Scotland* (Edinburgh, 1861).

EADMUND, ĕd′mŭnd. See Edmund.

EADS, ēdz, James Buchanan (1820-87). An eminent American engineer and inventor. He was born in Lawrenceburg, Ind., but removed to Saint Louis in 1833; became a clerk on a Mississippi steamboat in 1839; and, having studied engineering by himself, set out to solve some of the problems of navigation on that river. By the outbreak of the Civil War he had achieved fame and a fortune, and was accounted such an authority on everything pertaining to the Mississippi and its navigation that, soon after the fall of Fort Sumter, he was called to Washington to consult with President Lincoln and his Cabinet as to the practicability of maintaining a fleet of light ironclads on the Western rivers. Later in the year 1861 he obtained the Government contract for the construction of such a fleet, and achieved the remarkable feat of placing in the water, fully equipped, seven ironclad river gunboats, largely of his own designing, in the short space of one hundred days. It was with these gunboats, a month before the struggle between the *Merrimac* and the *Monitor*, that the capture of Fort Henry was effected. From 1867 until 1874 Eads was engaged in the construction of the steel arch bridge across the Mississippi at Saint Louis, which ranks as one of the finest bridges in the world. After the completion of this work he began studying the problem of deepening the channel at the mouth of the Mississippi, and finally persuaded the Government to allow him to undertake the enterprise at his own risk. His plan, which provided for the construction of jetties, was carried out successfully, and was the crowning achievement of his career. The latter years of his life were spent in extensive engineering operations both in America and Europe, and the planning of a ship-railway across the Isthmus of Tehuantepec. In 1884 he received the award of the Albert medal conferred by the British Society for the Encouragement of Arts, Manufactures, and Commerce, he being the first American to receive the award. Consult How, *James B. Eads* (Boston, 1900), one of the "Riverside Biographies."

EAGAN, ē′gan, Charles Patrick (1841—). An American soldier, born in Ireland. He entered the Federal Army from civil life in 1862, with rank of first lieutenant, and upon the close of the Civil War was mustered out (1865). In 1866 he was appointed to the United States Army, with rank of second lieutenant, and by 1898 had risen to the grade of brigadier-general and commissary-general. As such he served during the Spanish-American War, at which time he was found to have issued among the rations designed for the United States forces in Cuba canned meats said to be in a condition so unwholesome as to render them unfit for food. In 1899 he was tried by court-martial for using violent and abusive language before the War Investigation Committee regarding General Miles, commander-in-chief of the army. He was sentenced to a suspension of six years from duty and military honors, and later was retired at his own request.

EAGLE (OF. *egle*, *aigle*, Fr. *aigle*, It. *aquila*, from Lat. *aquila*, eagle, from *aquilus*, dark-brown; connected with Gk. ἀχλύς, *achlys*, mist. darkness, Lith. *aklas*, blind). Any member of a group of birds of prey, variously defined, but typified by the genus Aquila, which contains the largest and most powerful of the Falconidæ. From the most ancient times the eagle has been universally regarded as the emblem of might and courage; and, like the lion, it has been fancifully invested with other attributes of greatness such as men thought to harmonize with these. Its extraordinary powers of vision, the vast height to which it soars in the sky, the wild grandeur of the scenery amid which it loves to make its abode, and perhaps also its longevity, have concurred to recommend it to poetic regard. It was associated with Jupiter in the Roman mythology, and its figure on the standards of certain Roman legions has descended to the national ensigns of the United States, Germany, Russia, etc.

True eagles have the beak not curved from the very base, like the true falcons, nor notched on the edge; neither are their wings so long in proportion to their size; their legs are very robust, their claws curved, sharp, and strong. In the most restricted use of the generic term Aquila, the true eagles (of which the golden eagle may be taken as a type) have a rather short bill, curved from the cere, with the edge of the upper mandible slightly sinuate, the tarsi short and feathered down to the toes. This last character distinguishes them at once from their nearest allies—the sea-eagles of the genus Haliaëtus. Nine species of true eagles are well distinguished, although in this, as in allied genera, much confusion has arisen from the diversity of plumage at different ages. Only one of them occurs in North America. This is the golden eagle (*Aquila chrysaëtus*), of which the 'ring-tailed' eagle is the young. It is 30 to 35 inches in length, and 6½ to 7 feet in spread of wing; the female is rather larger than the male. The color is dark brown, in some parts almost black; the head and back of the neck in mature birds covered with pointed feathers of a golden-red color; young birds have a considerable part of the tail white; the bright-yellow cere and feet give it its name. The golden eagle is the largest of the European eagles, and is found throughout Europe, Asia (north of the Himalaya), and most of North America. It prefers mountainous districts, and usually only one pair exists within a relatively extensive area. These eagles are rare east of the Mississippi, but are occasionally seen, especially in winter. They build a coarse nest of large sticks on cliffs or rocky ledges in the mountains, and lay two or three eggs, dull white, blotched and speckled with brown. A great quantity of food is required to support a pair of these birds and their two or three young ones; and not only hares, game of every kind, and lambs are carried to the eyrie, but larger animals are sometimes attacked.

The imperial eagle (*Aquila heliaca*) is usually regarded as that from which the Greeks and

Romans adopted their symbolism, and ranges from the eastern Mediterranean to China. It is somewhat smaller and darker than the golden eagle, and seems to be less noble in its feeding habits and behavior; indeed an impartial judgment must concede that the eagles do not nearly as well deserve the admirable qualities attributed to them by poetry and romance as do many of the lesser falcons—they are, in truth, not far removed from vultures in either structure or disposition. Much smaller, not exceeding 25 inches in length, are the spotted eagles (*Aquila maculata* and *Aquila clanga*) of central and southern Europe; while other less-prominent species are the tawny eagle (*Aquila rapax*) of Africa, the Indian tawny eagle (*Aquila vindhiana*), and the vulturine eagle (*Aquila verreauxi*) of South Africa, which is marked by a white rump, and must be distinguished from the eagle-vulture (q.v.). See also HAWK-EAGLE.

SEA-EAGLES. Next in importance come the sea-eagles or ernes of the genus Haliaëtus, which haunt coasts and large river-courses, and feed mainly upon fish in all parts of the world. Here belongs the American white-headed or 'bald' eagle, the national emblem of the United States (*Haliaëtus leucocephalus*)—an unfortunate choice when its predatory methods are considered. This eagle originally was numerous all over North America, and still survives near the coast, around the Great Lakes, and along the larger rivers in considerable numbers, wherever it is not too ruthlessly persecuted. It is nearly as big as the golden eagle, but is not feathered to the toes, and its head, neck, and tail, after the third year, are perfectly white. It does not migrate, except from the most northerly, ice-bound portions of its range, and is, indeed, a home-keeper, a single pair sometimes occupying the same great nest of sticks, repaired each season, for many years in succession, followed perhaps by their descendants, for nests are known (one is near Cleveland, Ohio) which have not been vacant for nearly a century. Two is the usual number of eggs. This eagle feeds upon fish mainly. For the most part this is picked, dead or dying, from the surface or shore; bald eagles have always abounded in the neighborhood of Niagara Falls, because of the constant supply of fish found there, killed by going over the falls or being caught in the whirlpools below. They also regularly attack fish-hawks, and compel them to drop what they have caught. When fish are not obtainable they eat carrion, or kill small birds and mammals, as do the buzzard-hawks, now and then capturing poultry.

The sea-eagles of the Old World are larger than the bald eagle. The most familiar is the white-tailed erne (*Haliaëtus albicilla*), now nearly exterminated from Great Britain, except in the far north of Scotland, but a familiar sight on the coasts of the Hebrides, and thence eastward throughout Europe and most of Asia. In Siberia and Kamchatka still greater species are found, Steller's sea-eagle, which ranges from China and Japan to the Aleutian Islands, attaining a length of 41 inches—the largest of its tribe. Africa has several species.

CRESTED AND OTHER EAGLES. Members of several allied genera are usually called eagles. A remarkable one is the 'bataleur' (*Helotarsus ecaudatus*) of Africa, whose plumage is most strikingly variegated with maroon, black, and gray, and whose head is covered with large upstanding feathers; its food is mainly snakes and lizards. The buzzard and harrier eagles of the genera Batastur and Circaëtus, whose several species are African and South Asiatic, are also fond of a reptilian diet; while an Oriental genus (Spilornis) of large handsome birds are usually called by natives 'serpent eagles' (q.v.); among the most conspicuous of these is the Philippine one (*Spilornis holospilus*), the whole plumage being brown, spotted with white. Several forms of handsome crested eagles are African and East Indian, and much that is interesting might be related of them and of the hawk-eagles, did space permit. Australia possesses a single and peculiar species in the carrion-feeding wedge-tailed eagle (*Uroaëtus audax*); and in the fierce tropical harpies (genus Harpyhaliaëtus) South America has representatives of this family almost equaling in size and surpassing in courage and power those of all the rest of the world. See HARPY-EAGLE.

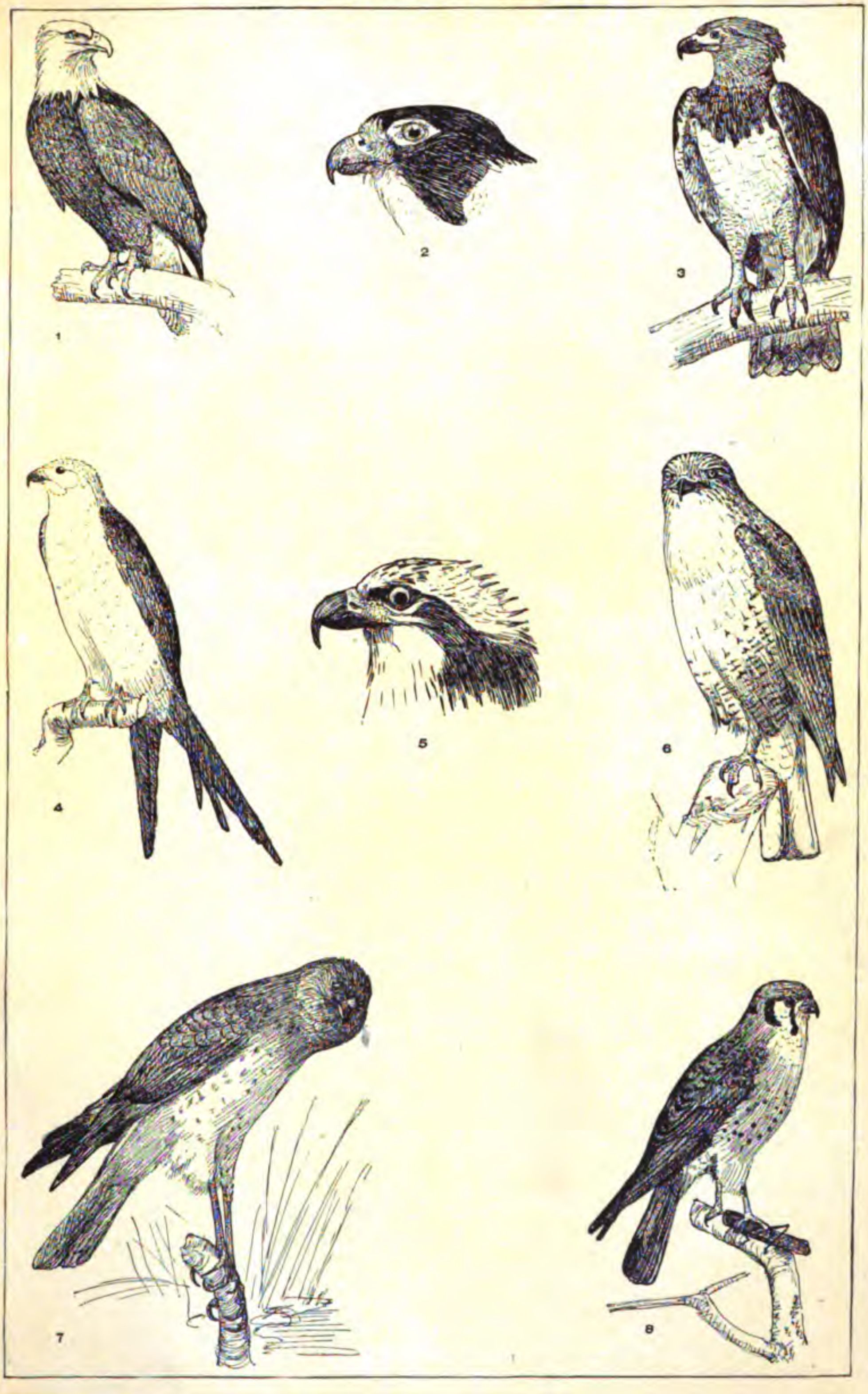
The literature relating to eagles is little separated from that of birds generally, as outlined under BIRD. For the limited use made of eagles in falconry, where they were counted 'ignoble,' see FALCONRY. See Plate of EAGLES AND HAWKS.

EAGLE. A military standard, adopted by the Romans, and even by nations preceding them in history. The Persians, in the time of Cyrus the Younger, bore an eagle on a spear as a standard. The Romans for some time used the eagle, the wolf, the boar, the horse, and the minotaur for standards, but afterwards abandoned the last four and confined themselves to the eagle. The Roman eagle, sometimes of gold, but more frequently of silver, was about as large as a pigeon with extended wings, and was borne on the top of a spear, with a cross-bar or a shield to support it. Some of the eagles were represented as holding thunderbolts in their talons, and usually bore the name of the legion to which they severally belonged.

EAGLE, BLACK. An Order of chivalry in Prussia. It was founded by the Elector of Brandenburg, January 18, 1701—the day of his coronation as King of Prussia. The number of knights, in addition to the royal family, was originally thirty, but it is now unlimited. The Order is conferred for distinguished merit in the military or civil service of the State, and carries with it a patent of nobility. The insignia consist of a Maltese cross of blue enamel, and a black eagle displayed between the arms of the cross. On a circular plaque in the centre is the royal cipher F.R., with a laurel branch below and the words *Suum cuique* ("To each his own"). The cross is suspended by a broad ribbon of orange color hung across the left shoulder, and with it is worn an embroidered silver star fastened on the left breast. The centre of the star shows a black flying eagle with a laurel wreath and thunderbolt, and the same legend as the cross. Only reigning princes and Knights of Saint John may wear any other Order with the eagle, which is the highest decoration in Prussia.

EAGLE, RED, ORDER OF THE. A Prussian Order, founded in 1734 by the Margrave George Frederick Charles of Bayreuth, as a reorganization of the Ordre de la Sincerité. The Order was raised in 1791 by Frederick William II. to the rank of second in the monarchy.

EAGLES AND HAWKS



1. BALD EAGLE (Haliaetus leucocephalus).
2. DUCK HAWK or PEREGRINE FALCON (Falco peregrinus Var. anatum).
3. HARPY EAGLE (Thrasaetus harpyia).
4. SWALLOW-TAILED KITE (Elanoides forficatus).
5. OSPREY or FISH HAWK (Pandion Carolinensis).
6. NORTHERN ROUGH-LEG (Archibuteo lagopus Var. Sancti-Johannis).
7. MARSH HARRIER (Circus Hudsonius).
8. SPARROW HAWK (Falco sparverius).

All the Knights of the Black Eagle were received into this new Order, and it was afterwards decreed that only those who had been decorated with the Red Eagle in the first instance could receive the Black. In 1810 two more classes were added to the Order, and in 1830 the second class was subdivided into two. The badge consists of a white Maltese cross with red eagles between the arms, in the centre a golden plaque with the cipher F.W.R. and the motto *Sincere et constanter*. The ribbon is white, with two orange stripes.

EAGLE, James Philip (1837-1904). An American legislator, born in Maury County, Tenn. He served with distinction in the Confederate Army from 1861 to 1865, and had risen to the rank of lieutenant-colonel at the close of the war. In 1870 he became a minister of the Missionary Baptist Church. He was president of the Arkansas State Convention for twenty years (1878-98), and also served as chairman of its executive board. He became a member of the convention which framed the Constitution of Arkansas (1875), and after serving for several terms in the State Legislature, was elected Speaker in 1885. He was Governor of Arkansas from 1889 to 1892.

EAGLEGROVE. A city in Wright County, Ia., 19 miles northeast of Ft. Dodge, on the Chicago Great Western and the North-Western Line railroads (Map: Iowa, D 2). It is in an agricultural region. It was incorporated in 1882, and is governed by a mayor, elected biennially, and a unicameral council. Population, 1900, 3557; 1905, 3122.

EAGLEHAWK. A municipal borough of Bendigo County, Victoria, Australia, 4½ miles west of Bendigo and 106 miles northwest of Melbourne by rail (Map: Victoria, D 4). Valuable gold-mines are worked in the vicinity. Population, in 1891, 7300; in 1901, 8130.

EAGLE OWL. The name most often given in Europe to the great-horned owl (*Bubo ignavus*), representing a group of large, fierce owls of the Northern Hemisphere generally, of which the American great horned or hooting owl is a familiar example. They are characterized by a somewhat incomplete facial disk, two tufts of feathers (*horns* or *egrets*) of considerable size on the head, ears with small external openings, legs and toes covered with feathers, short, strong, curved bill, and long, curved, sharp claws. To this genus belong the largest of the nocturnal birds of prey. The eagle owl of Europe approaches in size (26 to 28 inches) the golden eagle, and preys on quadrupeds such as hares, rabbits, and young deer, and on grouse, and partridges. It seizes its prey with its feet, and seldom touches it with the bill till its struggles are over. It is an inhabitant of many parts of Europe and Asia, but it is rare in Great Britain. The eagle owl of America (*Bubo Virginianus*), the Virginian or great horned owl, is very similar to this species, but of inferior size. It does not scruple to attack half-grown turkeys, and often succeeds in making them its prey. It is found in almost all parts of both North and South America, and is not migratory. Eastern Asia has some allied species.

The habits of all these birds are essentially similar, and differ from those of the smaller owls (see Owl) only in their greater strength and boldness. They lay two or three white eggs, but an East Indian species (*Bubo coromandus*) is remarkable in laying, sometimes, distinctly spotted eggs. In northern regions the eggs are laid in March, or in February, and often incubated amid violent snow-storms. This owl is often seen in menageries. Its note is a deep, loud, two-syllabled hoot, but is varied sometimes into a hoarse, neighing laugh. Consult: Dresser, *Birds of Europe* (London, 1879); and other ornithologies (see Bird) for Old World species; Fisher, *Hawks and Owls of the United States* (Washington, 1893); Sclater and Hudson, *Argentine Ornithology* (London, 1888). See Plate of Owls.

EAGLE PASS. The county-seat of Maverick County, Tex., 169 miles west-southwest of San Antonio, on the Southern Pacific and the Mexican International railroads, and on the Rio Grande River (Map: Texas, D 5). It is in a coal mining, irrigation-farming, and stock-raising region, ships cattle, hides, and wool, and has lumber and brick yards. Being the port of entry for the Saluria District, it enjoys a flourishing international trade, which was important during the Civil War. Population, 1906 (local est.), 3,000.

EAGLE RAY (so called from the wing-like shape of the pectoral fins). A large ray of the family Myliobatidæ, and especially *Myliobatis Freminvillei*, of the warmer parts of the Atlantic Ocean. In this genus the disk is broad and sharply angular in outline, the cephalic fins form a soft, convex appendage before the snout; the tail is long and slender, giving the name whip-ray to some species. The habits and food are similar to those of sting-rays. See Ray.

EAGLE VULTURE. A vulturine sea-eagle (*Gypohierax Angolensis*), placed by some ornithologists between the eagles and kites, and by others nearer the true vultures. It is a bird of prey of the West African coast region from Senegambia to Angola, and also of a limited district near Zanzibar. It resembles a vulture in appearance, especially in the shape of the head, beak, and the naked space about the eye; but in habits is essentially a fish-eating sea-eagle. (See Eagle.) It haunts the mangrove swamps of the estuaries, but retires to the forests farther up the streams for breeding purposes. It is two feet in length and beautiful, being snowy white, with black wings and tail.

EAGLEWOOD. See Aloes Wood; Calambuco.

EAKINS, Thomas (1844—). An American figure and portrait painter. He was born at Philadelphia, and studied at the Pennsylvania Academy, and afterwards at the Ecole des Beaux-Arts, also studying sculpture with Dumont. He was for years professor of painting in the Pennsylvania Academy. He became a member of the National Academy of Design. An exhibition of his most characteristic works at the Saint Louis Exposition (1904) included a portrait of Cardinal Martinelli; the "Cello Player"; the "Clinic of Professor Gross"; "The Crucifixion"; and "Dextra Victrice." His recent exhibits were portraits of Professor Leslie W. Miller and Carroll Beckwith in 1905; and C. Taylor Snow in 1906.

EALING, ēl′ĭng. A town of Middlesex, England, about nine miles west of Saint Paul's, London (Map: London, E 5). Charles Dibdin, the popular song-writer; Henry Fielding, the novelist; and Lady Byron, were long residents of Ealing, and it is the birthplace of Huxley. The town maintains public baths, a library, art school, a hospital, and an electric-lighting plant. The population has increased from less than 4000 in 1851, to 33,000 in 1901.

EAMES, ēmz, CHARLES (1812-67). An American lawyer and journalist, born at New Braintree, Mass., and educated at Harvard. In 1845 he was appointed to the Navy Department at Washington, where he soon afterwards became associate editor of the Washington *Union*. He was sent by President Polk to negotiate a treaty with the Sandwich Islands. He was Minister to Venezuela during the administration of President Pierce. During his later years he ranked as an authority in admiralty and international law.

EAMES, EMMA (Mrs. JULIAN STORY) (1867—). An American soprano, born in Shanghai, China. She was brought to Maine at five, and a year later began her piano studies in Boston. Her mother, who was an accomplished amateur singer, took care of her promising voice and later secured Madame Piccioto and Clara Munger as her teachers. From 1886 till 1889 she was a pupil of Marchesi, whose intimacy with Gounod secured her an engagement at the Grand Opéra to replace Patti as Juliet in Gounod's opera. She made an instantaneous success, and during the two years in Paris sang also Marguerite and created Colombe in Saint-Saëns's *Ascanio* and the title part in *Zaïre* by De la Nux. In 1891 she sang in London, adding Elsa and Desdemona to her repertoire. Here she married Julian Story, the portrait painter. In November of that year she appeared in New York singing also Santuzza, Eva, and the Countess in *Le Nozze di Figaro*. Since then she has appeared frequently in New York, London, Madrid, and Monte Carlo, where she created Franck's *Ghiselle* in 1896. Her repertoire, in French, Italian, German, and English includes, besides the parts mentioned, Micaela, Elisabeth, Sieglinde, Mrs. Ford (*Falstaff*), Pamina, Aïda, Valentine, Charlotte (*Werther*), Donna Elvira, Ero, Yasodhara (*Light of Asia*), and Lady of Longford.

EAMES, WILBERFORCE (1855—). An American librarian, born at Newark, N. J. In 1885 he became an assistant at the Lenox Library, New York City, and in 1893 librarian. Subsequent to the consolidation, in 1893, of the Lenox Library with the Astor and Tilden trust foundations, to constitute the New York Public Library, he was known as "Lenox librarian." He edited a comparative arrangement (1882) of the King James and revised versions of the New Testament, vols. xv.-xx. (1885-92) of Sabin's *Dictionary of Books Relating to America*, and, for the Lenox Library, a comparative edition of four Latin texts (with new Engl. trans., 1892; rev. ed., 1893) of Columbus's *Letter to Sanchez on the Discovery of America*. His further writings include contributions to Pilling's *Indian Bibliographies* (*Notes on Eliot's Indian Bible;* 1890), and *Early New England Catechisms* (1898).

EAR (AS. *ēare*, Ger. *Ohr*, Goth. *ausō*, OChurch Slav. *ucho*, Lith. *ausir*, Lat. *auris*, Gk. *οὖς*, *ous*, ear). The organ of hearing as it exists in man and the mammalia. It is composed of three parts: the external ear, the middle ear or tympanum, and the internal ear or labyrinth.

THE EXTERNAL EAR. This consists of two portions, the auricle or pinna (the part popularly recognized as the ear), and the auditory canal or external auditory meatus. The auricle, on its outer or more exposed surface, presents various eminences and depressions, resulting from the form of its cartilaginous framework. The rim, called the helix, incloses a narrow groove —the fossa of the helix — of which the inner boundary is a longitudinal ridge, parallel to the helix, and known as the antihelix; usually the antihelix is divided above into two ridges which inclose a shallow depression termed the fossa of the antihelix. The large central hollow containing in its bottom the opening of the auditory canal is called the concha. In front of the external auditory meatus there is a pointed process directed backward and known as the tragus; corresponding to this is the similar process behind the meatus and pointing forward, termed the antitragus. The lowest and pendulous portion of the auricle is called the lobule.

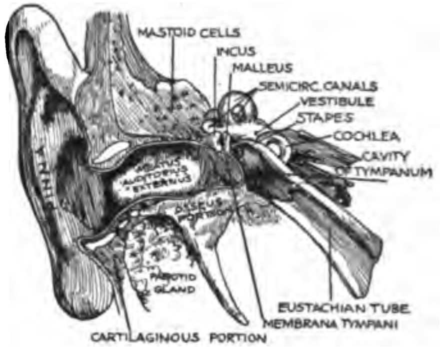


FIG. 1. THE ORGAN OF HEARING (RIGHT) FROM IN FRONT.

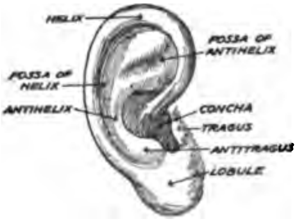


FIG. 2. THE AURICLE OR PINNA.

The intrinsic muscles of the auricle are, in man, functionless. Besides these there are three extrinsic muscles, passing from the adjacent portions of the scalp to the ear; they are the attollens aurem, attrahens aurem, and retrahens aurem; they are rudimentary in man, though occasional individuals are able to contract them and thus perform perceptible movements of the ear at will.

The auditory canal is slightly arched and passes inward and a little forward from the concha to the tympanum; it is about 1¼ inches long; at its outer end there are a number of ceruminous glands, which furnish an adhesive, yellow, and bitter substance, the ear-wax (see CERUMEN), which serves to protect the ear from insects, dust-particles, etc. The canal is partly cartilaginous and partly osseous; the osseous portion consisting in the fœtus of a bony ring, across which the drum-membrane is stretched, and in many animals remaining persistently as a separate bone. The entire canal, as well as the outer surface of the drum-membrane, is lined with skin.

The Middle Ear. This is a small, irregular cavity in the temporal bone, lined with a mucous membrane, the epithelium of which is ciliated like that of the Eustachian tube and pharynx, with which it is continuous. It contains three ossicles—the malleus (hammer), incus (anvil), and stapes (stirrup) — joined by ligaments to form a small chain attached to its outer end, by the handle of the malleus, to the drum-membrane, and at its inner end, by the base of the stapes, to the membrane covering the *fenestra ovalis.* The muscles of the middle ear are the *tensor tympani* and the *stapedius.* The former arises from the under surface of the petrous portion of the temporal bone and is inserted into the handle of the malleus. The latter takes its origin from the hollow conical eminence, termed the pyramid, which lies behind the *fenestra ovalis,* and is inserted into the neck of the stapes; by pulling the neck backward it probably compresses the contents of the vestibule. The Eustachian tube, into which the tympanic cavity opens anteriorly, is about an inch and a half in length, and passes downward, forward, and inward to its opening in the pharynx. It is partly bony, but chiefly cartilaginous. It serves for the escape of mucus from the middle ear into the pharynx; also by allowing free passage of air in and out of the tympanum it renders the pressure upon the inner surface of the drum-membrane equal to the atmospheric pressure upon its outer surface. Upon the inner wall of the tympanum there are two openings: the *fenestra ovalis,* mentioned above, leading into the vestibule; and the *fenestra rotunda,* covered by a membrane, leading into the cochlea.

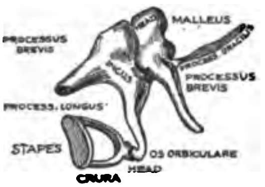


Fig. 3. small bones of the ear.

The Internal Ear, or Labyrinth. This consists of three parts: the vestibule, the cochlea, and the semicircular canals. The vestibule is a small central cavity communicating by openings in its posterior wall with the semicircular canals; anteriorly, the cochlea enters it by a single opening, the beginning of the *scala vestibuli* described below. On its outer wall is the *fenestra ovalis,* and on its inner there are a number of minute orifices for the entrance of the filaments of the auditory nerve. The cochlea (Lat., snail-shell) is situated in front of the vestibule. It is a spiral canal wound around a bony axis, termed the modiolus, which is perforated at its base for the entrance of the filaments of the cochlear portion of the auditory nerve. The interior of the cochlea is subdivided by an osseo-membranous partition, the *lamina spiralis,* into two passages: the *scala vestibuli,* opening into the vestibule, and the *scala tympani,* the communication of which with the tympanic cavity—the *fenestra rotunda*—is covered by a membrane as described above; the two scalæ communicate at the apex of the cochlea by an opening called the *helicotrema.* Between the two scalæ there is a third space, termed the *scala intermedia,* which contains the terminations of the filaments of the auditory nerve in a complicated arrangement of peculiarly formed neuro-epithelial cells termed collectively the organ of Corti. (See Auditory Nerve.) The semicircular canals are three in number, and open at both ends into the vestibule. They vary in length, and, notwithstanding their name, each is considerably more than a semicircle, the superior vertical canal being the longest. Their average diameter is about a twentieth of an inch, the extremities of each canal exhibiting a slight dilatation called an *ampulla.* Each canal lies in a different plane, very nearly at right angles to the planes of the other two, hence their names of the superior vertical, the inferior vertical, and the horizontal canals. We now turn to the membranous labyrinth. The membranous and osseous labyrinths have the same shape, but the former is considerably smaller than the latter, a fluid, termed the perilymph, intervening in some quantity between them. At certain points the membranous is firmly adherent to the osseous labyrinth. The vestibular portion consists of two sacs, an upper and larger one, of an oval shape, termed the utriculus, and a lower and smaller one of a more globular shape, called the sacculus.

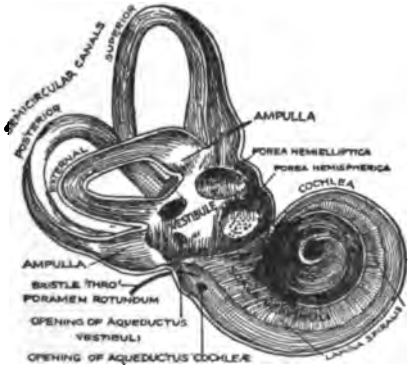


Fig. 4. the osseous labyrinth, laid open and enlarged.

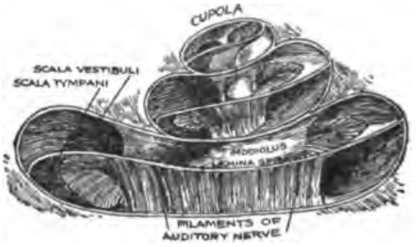


Fig. 5. the cochlea, enlarged.

The membranous semicircular canals resemble in form and arrangement the osseous canals which inclose them, but are only one-third of the diameter of the latter. The membranous labyrinth is filled by a fluid which is termed the endolymph; and in certain spots, especially at the terminations of the vestibular nerves, there are, suspended in the somewhat gelatinous endolymph, crystals of calcium carbonate known as otoliths, i.e. ear-stones, which are supposed to intensify the impression of the sound-waves upon the nerve-endings.

We now proceed to consider the different functions of the various parts of the ear.

The External Ear. A true auricle exists only in the mammalia, and in this class it varies from little more than an irregularly shaped cartilaginous disk, with little or no motion, as in man and the quadrumana, to an elongated, funnel-shaped ear-trumpet, movable in all directions by numerous large muscles, as in the horse, the rabbit, etc. The mode in which we see it employed in animals in which it is highly developed sufficiently indicates that its main function is to collect the sound-waves that fall upon it, and to direct and concentrate them upon the drum-membrane.

The Middle Ear. The vibrations of the tympanic membrane are transmitted through the ossicles and the membrane covering the fenestra ovalis to the perilymph. The pressure in the tympanic cavity is kept the same as that of the atmosphere by the Eustachian tube. Whenever the drum-membrane is too tightly stretched, by increase or decrease of pressure within the middle ear, it cannot vibrate freely, and hearing is impaired. This often occurs as a result of acute and chronic inflammation of the pharynx, when the swelling of the mucous membrane closes the Eustachian tube, producing the so-called 'throat-deafness.'

The Internal Ear. Sound is conducted to the labyrinth either by the external and middle ear, as described above ('air conduction'); or through the bones of the head ('bone conduction'); normally air conduction is better than bone conduction. In diseases of the middle ear or in obstructions of the external auditory meatus, air conduction is not so good as bone conduction. Advantage is very frequently taken of this fact in the differential diagnosis between diseases of the internal ear and those of the middle or of the external ear. To test the air conduction a vibrating tuning-fork is held close to the ear; to test the bone conduction the handle of the tuning-fork is brought in contact with the teeth, forehead, mastoid process, etc., in turn. As stated, it is the base of the stapes that communicates the vibrations to the perilymph; this would be impossible but for the existence of the *fenestra rotunda*, which acts as a vent for the vibrations of the perilymph and endolymph; every time the membrane of the *fenestra ovalis* bulges in, that of the *fenestra rotunda* bulges out, and vice versa. The internal ear also performs the most essential function connected with hearing: that of perception of auditory impressions by means of the cochlear and vestibular terminations of the auditory nerve. It remains for us now to consider the function of the semicircular canals. It is now a generally recognized fact that they are not connected with the sense of hearing. They have to do with the maintenance of the equilibrium of the body. This fact was established by Ewald in 1892. To maintain equilibrium in the various positions of rest and especially in locomotion, the accurate coördination of a great many muscles is necessary. The cerebellum is the organ which sends out the nerve-impulses to these muscles; this action is an unconscious one, being purely reflex in character. The afferent impulses which bring about these reflexes are, besides others of secondary importance, the ones conveyed to the cerebellum from the semicircular canals. When these canals are removed in animals, or when they are diseased in man, as in Menière's disease, there are invariably profound disturbances of equilibrium, the subject being unable to stand or even to sit, without swaying or falling, to say nothing of such complicated acts as walking, jumping, etc.

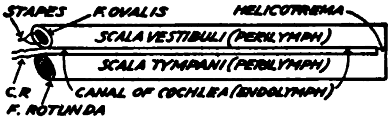

STAPES
F. OVALIS
HELICOTREMA
SCALA VESTIBULI (PERILYMPH)
SCALA TYMPANI (PERILYMPH)
C.R
F. ROTUNDA
CANAL OF COCHLEA (ENDOLYMPH)

FIG. 6. DIAGRAM TO ILLUSTRATE USE OF FENESTRA ROTUNDA.

The range of hearing, like that of vision, varies remarkably in different persons. Some persons are insensible to sounds which others can readily hear. The ordinary range of human hearing includes, according to Wollaston, more than nine octaves. Technically stated, the normal ear perceives vibrations as musical notes from 16 vibrations per second to about 32,500. The sensation of sound, like that of light, frequently lasts longer than the exciting cause. We have familiar proof of this fact in the noise which remains in the ears after a long journey in a coach or railway car; and this fact was clearly demonstrated by Savart, who found, in his experiments on toothed wheels, that the removal of one tooth did not produce any interruption of the sound.

DISEASES.

The diseases of the ear are divided into diseases of the auricle, diseases of the external auditory apparatus, diseases of the middle ear, and diseases of the mastoid process.

Diseases of the Auricle. Under this head are included congenital malformations of the auricle, such as deformities, appendages and supernumerary growths, wounds, injuries, cutaneous diseases, inflammatory processes attacking the cartilage, abscesses, erysipelas, and tumors.

Diseases of the External Auditory Apparatus. Under this head are included furuncle or boil, cellulitis, impacted wax, foreign bodies in the ear, bony growths, and wounds or other injuries of the drum-membrane.

The conditions mentioned in the two foregoing divisions need no more than individual mention, either because their treatment is similar to that of similar conditions elsewhere in the body, or because their titles suggest the remedies appropriate.

Diseases of the Middle Ear. (1) *Tubal catarrh* is a congestive condition of the Eustachian tube, leading from the throat to the middle ear. The result of this affection is closure of the tube, with deafness and constant noises heard, with a sense of fullness in the head. Inflation of the tube is the treatment, with possibly subsequent dilatation and treatment with medicated vapors. (2) *Acute catarrhal inflammation of the middle ear* is an affection of the superficial structures that line the middle ear, with the production of sero-pus in such quantity that often the ear-drum bulges and may even burst. Incision is necessary to prevent bursting and to secure drainage. The malady may complicate measles or catarrh of nose and throat, or may be caused by the introduction of fluid through the Eustachian tube while bathing. In young children the disease may appear suddenly at night, with a temperature of 102° to 104°, and a period of intense suffering, relieved by rupture of the drum, and pouring out of a little serous discharge that stains the pillow. Rise of temperature may continue on the following day, together with deafness and noises in the ear. As a rule, the cases terminate favorably without treatment. Suppuration may occur involving the mastoid cells. The treatment is directed first to relief of pain, by using a saline cathartic and an opiate. Local bloodletting by means of the artificial leech and the application of dry heat may abort an attack. If these measures fail to abort it, incision of the drum must be made, and the ear must be syringed, and dressed antiseptically. (3) *Chronic catarrhal inflammation of the middle ear* is either of the hypertrophic or of the hyperplastic variety. In the hypertrophic variety there is a swelling of the lining membrane of the tympanum due at first to chronic venous congestion, after which occurs hypertrophy of the elements of the tissue lining the cavity. Fibrous layers appear and calcareous deposits may ensue. The drum-membrane, the ossicles, the ligaments and the walls of the Eustachian tubes share these changes. Exudate of serum or seromucus collects in the cavity. Among the causes for this condition are repeated attacks of acute rhinitis, the presence of adenoid tissue in the vault of the pharynx, impairment of the general health, and the abuse of alcohol. The results are impaired hearing, whistling or buzzing or crackling noises in the ear, and occasional neuralgic pains, especially upon swallowing. Entire recovery can never be promised in these cases, but treatment by the aural surgeon, of a technical and intricate nature, may cause vast improvement, and avert total deafness. Chronic hyperplastic otitis media may develop from the hypertrophic form, and is characterized by an appearance of firm and fibrous new tissue, diminished secretion, thickening of the walls of the supplying blood-vessels, with a resulting sclerosis. The symptoms resemble closely those of the hypertrophic variety, with the addition of giddiness in the early stages and a marked neurasthenic or even melancholic condition, due partly to the temperamental state which invited the attack, partly to the fatigue of the higher cerebral centres resulting from repeated efforts to hear conversation. The prognosis for recovery is very grave, and the disease is less amenable to treatment than any other aural trouble. Treatment is directed by the aural surgeon toward the relief of the rigidity of the ossicular chain, by inflation, exercise of the tubal muscles, the use of the Eustachian bougie, and of the myringotome and several operative procedures. Hydrobromic acid or pilocarpine may be desirable for internal use. (4) *Acute purulent otitis media* most frequently follows an infectious disease, such as scarlatina, *la grippe*, smallpox, cerebro-spinal meningitis, pneumonia, etc. Pus forms behind the drum-head and may dissect its way into the neighboring soft parts or may invade the mastoid. The prominent symptoms are very severe pain deep within the ear, a temperature of 101° or 103°, severe general headache, and great depression. Invasion of a sinus may ensue, and pyæmia may result, accompanied by a higher temperature, delirium, convulsions, and paralysis. Immediate and vigorous operative measures employed by an aural surgeon constitute the only treatment. (5) *Chronic purulent otitis media* occurs as a sequel to the acute form, and, like it, is due to tissue necrosis. Discharge from the ear is the only prominent symptom, and one which should always suggest the necessity for competent medical advice. (6) *Otitis media purulenta residua* is a term applied to a class of cases in which a former purulent inflammation has resulted in a permanent destruction of some of the tympanic structures. It may be either acute or chronic. The aural surgeon alone can differentiate this condition and advise regarding the antiseptic irrigation necessary or the removal of dead bone which may have become imperative.

Diseases of the Mastoid Process. Inflammation of this process may result from extension of a similar process from the middle ear. A chronic suppurative otitis media is the most frequent cause of acute mastoiditis. It may follow exposure to cold, a traumatism, or general tubercular or syphilitic infection. A destruction of the osseous tissue results. The most prominent symptom is intense pain over the mastoid bone, especially at night, a temperature of 99.5° to 101.5°, difficulty in moving the head from side to side, and tenderness upon deep pressure over the tip of the mastoid. But slight constitutional disturbance is present. Involvement of a venous sinus with the production of an infectious thrombus may occur; emboli may develop and lodge in various viscera; diffuse meningitis may complicate the disease, with resulting paralysis; or the rarer cerebral abscess may follow. The diagnosis of mastoid disease is a matter of difficulty for any but an expert observer, although two signs are very reliable. These are, local tenderness upon deep pressure over the mastoid region; and a depression or sagging of the supero-posterior wall of the canal, close to the tympanic ring. Besides these signs, a localized tumefaction of the postero-superior canal wall (if it occur) is very indicative of mastoid involvement. Many other symptoms present themselves, similar to those enumerated in the consideration of other diseases afflicting the ear. The prognosis is always grave. The treatment consists in rest in bed, fluid diet, catharsis, extensive incision of the drum-membrane, if seen early, together with irrigation of the canal and the employment of the Leiter coil, by which cold is applied to the whole mastoid portion of the temporal bone. Certain drugs are given to relieve pain. After 48 hours have passed without amelioration, operative interference is necessary. In such a case, the surgeon makes an incision through the soft parts back of the ear, commencing over the middle of the mastoid insertion of the sterno-cleido-mastoid muscle, about one-half inch below the tip of the mastoid process, cutting upward and forward close to the line of insertion of the auricle and following this line to a point directly above the meatus. This incision is carried down to the bone, and the soft parts are retracted, and the periosteum is raised from the bone. With mallet and chisel an opening is made through the cortex into the mastoid cells, and all softened bone-tissue is removed with the sharp spoon. The mastoid antrum is entered and the entire pneumatic structure of the mastoid is then obliterated. Drainage is secured by means of a tube passed into the bony meatus, and the external incision is closed up and a dressing applied.

Consult: Gray, *Anatomy, Descriptive and Surgical* (Philadelphia, 1900); Halliburton, *Kirke's Handbook of Physiology* (Philadelphia, 1901); Dench, *Diseases of the Ear* (New York, 1903); Bacon, *Manual of Otology* (New York, 1902); Article "Ear" in *Reference Handbook of the Medical Sciences* (New York, 1902); Whiting, *The Modern Mastoid Operation* (New York, 1905). See AUDITION; ACOUSTICS, and the authorities there referred to.

EAR, COMPARATIVE ANATOMY OF THE. The question of the hearing powers of animals is still a subject of dispute, and we cannot say positively whether the lower animals are conscious of sound-waves, as such, or not. But if we bear in mind that the human ear is not merely an organ of hearing, but is also the means by which we determine our position (in other words a positional organ), then we are justified in saying that many invertebrates have ears, even though we deny them the sense of hearing.

POSITIONAL AND CHORDOTONAL ORGANS. Positional organs as found in the simplest conditions are minute balls of mineral matter suspended in a flexible club-shaped body, and are known as 'sense-clubs.' They are formed on the margin of the bell in many medusæ. In some cases they are surrounded by long hairs against which they strike when they move. In a still more advanced condition, they are situated in a depression, and the surrounding tissue grows over and about them, so as to inclose them in a cavity. It is but a step from such a condition to the form of positional organs, called otocyst, which occurs in many invertebrates. An otocyst is a spherical cavity lined with cilia and containing one or more balls of mineral matter called otoliths. The otocyst is specially and fully innervated, the stimuli coming from the movements of the otolith against the cilia, accompanying changes in the position of the body. There is no evidence to show that such organs are capable of detecting sound-waves. Otocysts occur in medusæ, many kinds of worms, numerous mollusks, a few echinoderms, and the higher crustacea. In the latter, the vesicles often remain open and the otoliths are grains of sand; the vesicles are lined with delicate hairs, some of which are actually attached to the otoliths. Insects have no otocysts, but in their place we find remarkable structures known as 'chordotonal' organs, which lie in the integument of various parts of the body. They are largest and most highly developed in grasshoppers, locusts, and crickets, and two or four of them are very large and are known as the 'tympana.' They lie on the sides of the abdomen or on the tibiæ of the fore legs. Chordotonal organs seem to be particularly adapted for the detection of sound-waves, but how they can serve as positional organs is not clear.

PRIMITIVE AUDITORY ORGANS. Turning now to vertebrates, we find a general agreement with the structure of the human ear, even in fishes, although in details and proportions there is much variety. In the cyclostomes it is probable that there is no real sense of hearing, for the semicircular canals are the only well-developed parts of the ear, and these are believed to be specially concerned with the positional function. Whether other fishes actually hear sounds is still a disputed question. The cochlea is, in fishes, simply a small knob-like appendage of the sacculus, and shows none of the complexity of the mammalian cochlea. In most fishes large otoliths are present in the labyrinth, and in many fishes there is direct connection between the ear and the air-bladder by means of a chain of small bones. Recent experiments (1902) by Dr. G. H. Parker of Harvard apparently demonstrate the actual recognition of sounds by some fishes, and that this recognition is dependent upon the uninjured condition of the ears and auditory nerves. In Amphibia the cochlea is more highly developed, and this part of the ear increases in complexity as we pass upward through reptiles to birds and mammals. Even in crocodiles and birds, however, there is no organ of Corti in the cochlea, and there is a single bony columella instead of the three auditory ossicles of mammals. In many respects the ears of monotremes are noticeably like those of the Crocodilia. Fishes, amphibians, and most reptiles have no outer ear, and the pinna is only found in certain mammals.

BIBLIOGRAPHY: Lang, *Comparative Anatomy* (New York, 1896); Wiedersheim, *Comparative Anatomy of Vertebrates* (New York, 1897); Retzius, *Das Gehörorgan der Wirbelthiere* (Stockholm, 1881 and 1884); Gegenbaur, *Vergleichende Anatomie der Wirbelthiere* (Leipzig, 1898).

EARCOCKLES, PURPLES, or PEPPER-CORN. A disease in wheat caused by a nematode worm (*Tylenchus tritici*). This worm is yellowish-white, slender, tapering toward the tail, and more suddenly attenuated to a point at the head. It finds its way to the flowers; the infected grains become dark green, then black, rounded like small pepper-corns, and furrowed on the surface; the glumes spread open, and the awns become twisted; the grains are filled with a white cottony substance which consists of myriads of the nematodes. The disease has not been reported in the United States.

EARL (AS. *eorl*, Icel. *earl*, Dan. *jarl*, earl, OS., OHG. *erl*, man, warrior). A title of the British nobility, third in rank under the princes of the blood royal, next to a marquis, and above a viscount. In Anglo-Saxon times the word denoted the primitive noble by birth of the first settlement, the *nobilis* of the Old Germans, as distinguished from the *ceorl*, or common freeman. From this class the magistrates, priests, and kings were chosen. But with the development of the royal power in England, and consequently of thanehood, a nobility by service, the *eorl* sank one degree in the social scale, and was merged into the class of thanes.

In the later Saxon period the word *eorl* changed its significance, being used for *ealdorman*. This was an administrative officer, the chief magistrate of a shire or cluster of shires. He was originally a viceroy, the subjected king of a conquered district or one of his family, or a near kinsman of the over-king (*ætheling*). The office might be hereditary, but it tended to become appointive. The ealdorman was appointed in the general assembly of the nation, and even where the office was hereditary, the consent of king and nation was necessary. He sat with the bishop in the folkmoot of the shire, declaring the secular law, as the bishop did the spiritual. He was head of the military levy of the shire, and exercised the royal police jurisdiction.

To maintain his dignity, he received a third of the profits of the administration of justice in the shire. After the Danish incursions the office became an upper governorship and the incumbent was frequently changed. The Danish word *jarl*, English *eorl*, was applied to it. Canute divided England into four earldoms, and there were five under Edward the Confessor.

William the Conqueror, while retaining all the dignity of the office, reduced its power by making it hereditary and giving its judicial functions to the sheriff or vicecomes (vice-earl), his own appointee. The great earldoms were gradually broken up, and the holdings of the earls scattered through different shires. William bestowed the title sparingly, but under his successors, especially during the civil war of Stephen and Matilda, it was lavishly given. This ceased with Henry II. The title corresponded with the French *comte*, an earl's wife being always called 'countess.' The office of earl remained essentially a county office, usually taking its name from the shire. The third penny of the pleas was still granted to show this connection, and does not disappear until the thirteenth century, when its place is taken by a fixed sum called creation money. The earl was the highest in rank of the nobility until Edward III. created a duke in 1357 and Richard II. a marquis in 1385. He had a hereditary right to a seat in Parliament.

The title was originally conferred by investiture, the King himself girding on the sword of the county (signifying the temporal authority in the county). Edward III., wishing to avoid the hatred caused by his father's investiture of favorites, first began the custom of creating earls in Parliament, and also that of investiture by charter or letters patent. Now, only the last-named method prevails. The dignity of an earl is not partible, and although it may descend through a woman, it reverts to the Crown in case of coheirs. In the fourteenth century limitations to heirs male of the body became the rule.

The number of earls varies in the different periods of English history. In the Middle Ages there were very few earls, but the Stuarts greatly increased the number, especially James I., who sold the dignity for £20,000. Now there are over two hundred earls in the United Kingdom, and the territorial nature of the dignity has so far disappeared that they even take the titles from their names, as did Earl Grey and Earl Russell. The earl's coronet is a gold circlet, with light spikes, on the tips of which are pearls alternating with strawberry-leaves.

Bibliography. For the earliest period the sources are the Anglo-Saxon laws, in the editions of R. Schmid (Leipzig, 1832); B. Thorpe (Record Commission, 1840); and best of all, F. Liebermann (Halle, 1898, sqq.). Compare Schmid's *Glossary*, *sub* 'Eorl,' and Liebermann's *Commentary*, vol. ii. Among modern authors are J. M. Kemble, *Saxons in England* (London, 1876); K. Mauer, *Kritische Ueberschau der deutschen Gesetzgebung* (Munich, 1853-56). The sources for the period since the Conquest are best found in the letters patent and other material published in *Reports from the Lords' Commission on the Dignity of a Peer of the Realm* (London, 1820-29), especially in the third report. Based on this is Sir Harris Nicholas, *Historic Peerages of England* (continued by W. Courthope, London, 1857), *sub* 'Earl.' Good brief modern accounts for the entire period are those of William Stubbs, *Constitutional History* (Oxford, 1894), vol. i. 125-26, 168-69, 176-78; R. Gneist, *History of the English Constitution*, translated by P. A. Ashworth (New York, 1886), vol. i., 138-41; see p. 140, note, for the older literature. R. Selden, *Titles of Honor* (London, 1614), is still useful.

EARLE, Alice Morse (1853—). An American writer on Colonial history. She was born in Worcester, Mass., and graduated at the Worcester High School. She has written voluminously on the social and domestic history of Colonial New England and New York, and in her various books presents a mass of quaint and interesting information. Her publications include: *The Sabbath in Puritan New England* (1891); *China Collecting in America* (1892); *Customs and Fashions in Old New England* (1893); *Life of Margaret Winthrop* (1894); *Colonial Dames and Goodwives* (1895); *Costume of Colonial Times* (1895); *Colonial Days in Old New York* (1896); *Curious Punishments of Bygone Days* (1897); *Home Life in Colonial Days* (1898); *Child Life in Colonial Days* (1899); *Stage Coach and Tavern Days* (1900); *Oldtime Gardens* (1901); *Sun-Dials and Roses of Yesterday* (1902); *Two Centuries of Costume in America*, 2 vols. (1903).

EARLE, John (1824-1903). An English philologist and divine. He was born at Elston, and was educated at Oxford, where he was professor of Anglo-Saxon from 1849 to 1854, and again after 1876. He was appointed rector of Swanswick in 1857, and prebendary of Wells in 1871. His principal publications are: *Gloucester Fragments* (1861); *The Philology of the English Tongue* (5th ed. 1892); *A Book for the Beginner in Anglo-Saxon* (3d ed. 1884); Anglo-*Saxon Literature* (1884); *English Prose: Its Elements, History, and Usage* (1890); *The Psalter of 1539: A Landmark in English Literature* (1894); *A Simple Grammar of English Now in Use* (1897); *The Alfred Jewel* (1901).

EARLE, Mortimer Lamson (1864-1905). An American classical scholar. He was born in New York, and received the A.B. from Columbia College in 1886 and his doctorate in 1889. From 1889 to 1895 he was instructor in Greek in Barnard College; he was then appointed associate professor of Greek and Latin in Bryn Mawr; from 1898 to 1900 he was lecturer in Greek in Columbia University; and in 1900 he became professor of classical philology in Barnard College, New York. His literary work included the editing of Euripides's *Alcestis* (1895); *Medea* (1904); and Sophocles's *Œdipus Tyrannus* (1900).

EARLE, Parker (1831—). An American horticulturist. He was born at Mount Holly, Vt., and after a residence of several years in Illinois, removed to Mississippi. He was director of the horticultural division in the International Exposition at New Orleans (1884); president of the Illinois State Horticultural Society, and in 1885 was elected president of the American Horticultural Society. His writings include frequent contributions to agricultural magazines.

EARLE, Pliny (1809-92). An American psychiatrist, born at Leicester, Mass. He received his medical education at the University of Pennsylvania, graduating in 1837; was a resident physician at Friends' Asylum for the Insane, Frankford, Pa., from 1840 to 1844; superintendent of Bloomingdale Asylum, New York City, from 1844 to 1853; visiting physician to the New York City Asylum, Blackwell's Island, from 1853 to 1864; professor of materia medica and psychology in the Berkshire Medical Institution at Pittsfield, Mass., from 1863 to 1864; and superintendent of the State Lunatic Hospital, Northampton, Mass., from 1864 to 1885. He published *A Visit to Thirteen Asylums for the Insane in Europe* (1841); *Bloodletting in Mental Disorders* (1854); *Psychologic Medicine, Its Importance as a Part of the Medical Curriculum* (1867); *The Psychopathic Hospital of the Future* (1867); *Prospective Provision for the Insane* (1868); *Curability of Insanity* (1877).

EARLE, Thomas (1796-1849). An American lawyer. He was born at Leicester, Mass., but when young settled in Philadelphia. He was a prominent member of the Philadelphia Constitutional Convention of 1837. By advocating the extension of the right of suffrage to colored men he antagonized many members of the Democratic Party, and in 1840 the Liberty Party made him their candidate for Vice-President. Subsequently he left politics for literary work, and published *Essay on the Penal Law; Essay on the Right of States to Alter and Annul Their Charters; Treatise on Railroads and Internal Communications* (1830); and a *Life of Benjamin Lundy.*

EARLE, William (1833-85). An English soldier. He was born in Liverpool, was educated in Winchester, and served with great gallantry in all the principal engagements of the Crimean War. He was advanced to the rank of colonel in 1868, and from 1872 to 1876 acted as military secretary to Lord Northbrook, Viceroy of India. He was commander of the prison at Alexandria during Lord Wolseley's campaign against Arabi Pasha, and in 1884 accompanied that general as division commander on the expedition dispatched to the aid of General Gordon at Khartum. He was killed while leading his detachment against the Arab intrenchments (January, 1885).

EARLINGTON. A city in Hopkins County, Ky., 54 miles south of Evansville, Ind., on the Louisville and Nashville Railroad (Map: Kentucky, D 3). It is in the centre of a coal-mining region and has extensive manufactures of coke. Under a charter of 1897 its government is vested in a mayor, elected for a term of four years, and a unicameral council of six members. Population, 1900, 3012; 1906 (local est.), 4000.

EARL MARSHAL. See Marshal.

EARLOM, ẽr'lom, Richard (1743-1822). An English engraver. He was born in London, and studied there under Cipriani. In mezzotint he made some innovations in the use of the point, which gave delicacy to his method, and established his fame by "Fruit and Flowers" after J. van Huysum. He engraved after Rubens, Rembrandt, Van Dyck, Correggio, and other Dutch and Italian masters. His most important work was the reproduction of two hundred drawings of Claude Lorrain in the Duke of Devonshire's collection, known as the *Liber Veritatis*, published in London, 1799, and again in 1804 with a hundred new plates.

EAR'LY, Jubal Anderson (1816-94). An American soldier, prominent on the Confederate side in the Civil War. He was born in Franklin County, Va., graduated at West Point in 1837, served in the Seminole or Florida War of 1837-38, and resigned from the army to take up the practice of the law at Rocky Mount, Va., in July, 1838. In 1841-42 he was a member of the Virginia House of Delegates, and from 1842 to 1847, and again from 1848 to 1852, he held the position of commonwealth attorney. During the Mexican War he was major of a regiment of Virginia volunteers from January, 1847, to August, 1848. On the approach of the Civil War he was strongly in favor of the maintenance of the Union, and in the Virginia Convention of 1861 he strenuously opposed the adoption of the ordinance of secession; but the ordinance having passed, he threw in his lot with his State and entered the Confederate Army as a colonel. He commanded a brigade at the first battle of Bull Run, rendering effective service to his side at a critical part of the battle; was promoted soon afterwards to be brigadier-general; took a prominent part in the battle of Williamsburg, May 5, 1862, where he was seriously wounded, and distinguished himself in the second battle of Bull Run and in the battle of Antietam. At Fredericksburg on December 13, 1862, he commanded a division, and during the battle of Chancellorsville he commanded the right wing of General Lee's army, stationed at Fredericksburg, which was opposed to the Federal General Sedgwick. He commanded a division of Lee's army at Gettysburg. Detached from that army in June, 1864, to operate against the Federal forces in the Shenandoah Valley, he repelled an attack of Hunter at Lynchburg on the 18th, and forced that officer to the Upper Potomac. The valley thus being left open, he advanced to Winchester, drove the Federal General Sigel to Maryland Heights, crossed the Potomac on July 6th, levied $20,000 on Hagerstown, and $200,000 on Frederick City, and on the 9th defeated Gen. Lew Wallace at Monocacy Junction. On the 11th he threatened the city of Washington, which was in a state of consternation, and which by a prompt attack he would probably have taken; but a strong Federal reinforcement having arrived, he withdrew without serious molestation, and retired up the Shenandoah Valley. Toward the latter part of the month he again drove across the Potomac the Federal forces opposed to him, and in addition sent a cavalry detachment into Pennsylvania under McCausland, who occupied Chambersburg on July 30th, and in default of a ransom of $100,000 in gold, burned the town in accordance with Early's orders. From August to November he contended against Sheridan, then in command of the Federal Army of the Shenandoah, for the possession of the Shenandoah Valley. He was finally defeated by superior numbers at Opequan Creek, near Winchester (September 19) and Fisher's Hill (September 22). On October 19 he surprised the Federals at Cedar Creek, but the timely arrival of Sheridan turned the fortunes of the day, Early's forces being routed. In March, 1865, Early was defeated by Custer at Waynesborough, and was removed from command by Lee after he had reached by successive promotions the rank of lieutenant-general. By many military critics he is placed below only Lee and Jackson in the list of Confederate generals. After the war he lived for a short time in Canada, but in 1867 returned to Virginia, practiced law there for a time, then was associated with General Beauregard in the management of the Louisiana Lottery at New Orleans, and passed his last years in Virginia. He steadfastly refused until his death to take the oath of allegiance to the United States. Besides several addresses on military subjects, he published *A Memoir of the Last Year of the War for Independence, in the Confederate States of America* (1867). For an account of General Early's operations in the Shenandoah Valley, consult: Johnson and Buel (ed.), *Battles and Leaders of the Civil War*, vol. iv. (4 vols., New York, 1887); Pond, *The Shenandoah Valley in 1864* (New York, 1883), in the "Campaigns of the Civil War Series"; and articles by Long and Daniel in vol. xviii. and vol. xxii., respectively, of the *Southern Historical Society Papers* (Richmond, 1890 and 1894).

EARLY ENGLISH. The term generally applied to the earliest form of Gothic architecture (q.v.) in Great Britain. It succeeded the Norman (q.v.) toward 1200, and was merged into the Decorated style (q.v.) at the close of the thirteenth century. The earliest works, which served as models, as the choir of Canterbury Cathedral (1175), were the work of Frenchmen, and purely in the French style. A mixed Anglo-Norman and French style appears in the choir and east transept of Lincoln Cathedral in 1190, which may be regarded as the best early example of Early English, with more of the original French traits than in later buildings. From the beginning the decorative elements had more originality than the constructive, which were mainly imperfect variations of the French. For years after Lincoln choir, buildings were erected with pointed design but not really Gothic in principle, because they either avoided vaulting altogether or adhered to the Norman style of heavy walls and imperfect equilibrium. The nave of Lincoln itself (1209-35) throws off many both French and Norman features, and is in line with pure Early English. The characteristics are: Very pointed arches; lancet windows; decorative supernumerary ribs in the vaulting; lack of connection between the interior stories by shafts running from pavement to crown of vaulting; high Norman triforium galleries; round abaci (see Abacus) instead of square; very slender banded shafts, often detached from their ground; low-vaulted and long naves, a peculiarity which, connected with the breaking of the vertical continuity, leads the eye along horizontal instead of the vertical lines of French Gothic. The internal structure is thus defective in organic qualities. Neither now nor in later styles does English Gothic follow the principles of any of the three main elements of the Gothic structure—the vault, the structural grouped pier with vaulting shafts, the buttress pier, and flying buttress. Consequently, the side walls can never be eliminated; the immense single windows used in France with tracery are impossible. There is no existing Gothic skeleton. The building that best exemplifies the normal plane of Early English, as soon as it had acquired full form, is Salisbury Cathedral (1220-58); while its contemporary, Wells Cathedral (1206-42), shows how much of the Norman was still usually retained under the Gothic surface. Other examples are the cathedrals of Ely (choir), Worcester (choir and transept), York (transept), Chester (choir), Durham (east end), Rochester (choir), and Fountains Abbey (east end). Heavy and impressive square towers, high screen-shaped façades, unconnected in outline with the structure, small and insignificant portals—these are some of the characteristics of Early English exteriors. Another feature, important for both external and internal effect, is the square-ending choir, which attained increasing popularity, so that only a few round-ending ones have survived. This made impossible a beautiful grouping of radiating choir chapels and choir aisles. Chronologically, Westminster Abbey belongs to this style; but while its infelicitous exterior is English, its interior, which is one of the most beautiful in the world, does not follow the Early English, but is a pure reproduction of developed French Gothic (1250). During the third quarter of the thirteenth century one sees the approach of those changes that herald the Decorated style (q.v.), especially in the presbytery of Lincoln (1256-82). Tracery begins to appear, and lancet windows are thrown together in more truly Gothic style. Consult: Rickman, *An Attempt to Discriminate the Styles of English Architecture* (London, 1819); Gwilt, *An Encyclopædia of Architecture*, revised by Papworth (ib., 1867); Moore, *Gothic Architecture* (ib., 1899); Prior, *History of Gothic Art in England* (ib., 1900).

EARLY ENGLISH TEXT SOCIETY. A society founded by F. G. Furnivall (q.v.) in 1864 for the publication of Old and Middle English manuscripts. It has issued every year original-series texts (devoted to first editions of manuscripts), and since 1867 extra-series texts (mainly reprints of old books printed by Caxton and other early publishers). The society has as members some of the best English scholars in England, the United States, and Germany. Its publications, numbering about 200, are indispensable to the student of early English literature.

EARN, ẽrn. A river and loch in the south of Perthshire, Scotland, in the beautiful valley of Strathearn (Map: Scotland, E 3). The loch is seven miles long, a mile wide, and very deep, and bordered by rugged hills. The river Earn flows east from the loch for 40 miles, past Comrie, Crieff, and Bridge of Earn (a popular summer resort), into the estuary of the Tay, seven miles southeast of Perth. Along the river, near Abernethy, under a thick bed of clay, is a peat bed two or three feet thick, supposed to be a continuation of the submarine forest at Flisk.

EARNEST (from Welsh *ernes*, *ern*, pledge). A coin or other article, usually of trifling value, given by a purchaser to his vendor 'to bind the bargain' of sale. The practice is one of great antiquity, and belongs to the order of ceremonial transactions so common in all early legal systems, the validity of which turns on the due observance of a prescribed form of proceeding rather than upon an inquiry as to the real intention of the parties thereto. The giving of earnest is, therefore, not at all the same thing as part payment on the one side or part delivery on the other, with which it is often confused; and, in the case of earnest proper, no allowance is made for the value of the coin or token given upon the settlement of the transaction. Notwithstanding its quaint and antiquated character, the giving of earnest is still recognized in the law of England and the United States as the equivalent of the consideration essential to the validity of a contract. The Statute of Frauds (29 Car. II., c. 3), as now existing in England and reënacted in the several United States, not only recognizes the legal validity of the act of giving earnest, but makes the distinction between it and the act of making part payment.

EARRING. An ornament suspended from the ear, which is bored for the purpose. The practice is of the highest antiquity, though in the present day it is chiefly confined to the lower classes in Europe and to the East. In the ancient world there was a marked difference between the Asiatic races, among whom earrings were worn by both sexes, and the Greeks and Romans, whose women alone used them. Earrings have always formed an important branch of artistic jewelry.

EGYPT AND ASSYRIA. Among the Egyptians the earliest rings were extremely simple, either single hoops of gold, from 1½ to 3 inches in diameter, or several hoops—as many as six—soldered together. Royal earrings were sometimes in the shape of an asp, set with precious stones. Later forms, copied from Asiatic and Hellenic models, show the ring ending in the form of a dragon or antelope's head; others are pendants in the form of a vase, with incrusted work or with heads of divinities in relief. But the earliest homes of the really artistic earring were Babylonia, and later Assyria, where it was a sign of rank among the men. Kings, nobles, and soldiers, as well as gods and genii wore earrings; the Assyrian bas-reliefs show the variety of their design. Their general form is of a pendant, sometimes a long drop or cone attached to a heavy ring or crescent, and often, especially under the later kings, in the form of a cross; or groups of balls, lion-headed or bull-headed genii, the symbols of Asshur and other gods. The materials were gold and silver; pearls were sometimes added. Molds for earrings have been found among the Assyrian palaces at Koyunjik and Nimrud. While the size and decoration were always kept within bounds by the Assyrian jewelers, greater gorgeousness was aimed at by the Persians, as well as by the artists of Phœnicia, Syria, and the pre-Hellenic peoples of the Ægean. The statues from Cyprus, the tombs of Syria and of Sidon, show Assyrian influence enriched.

GREEK AND ETRUSCAN. The Mycenæan and Homeric women used rich earrings. At Mycenæ and Hissarlik (Troy), the discoveries of Dr. Schliemann included many early gold earrings of different shapes—the bell-and-chain pendant, the fringe pendant, the gondola, the claw-shaped, the circular plaque, and several more. In the *Iliad* (xiv. 182-83), Hera wears earrings ending in three drops. The true gorgeousness of this period may be inferred from the examples found at Camiros in Rhodes; they are long pendants, with rectangular plaques, diversified by zones of nude figurines and heads joined by little chains hanging from rosettes of filigree-work. Henceforth earrings fall into two main classes: (1) those worn against or close to the lobe of the ear, and sometimes entirely concealing it; (2) those that hang below the ear and aim to continue its lines, not to conceal them.

The pre-Hellenic and Hellenic earrings, forming an elaborate network of design in several stories, appear to have influenced the Etruscans more than the later Greeks; for the Greek earrings of the sixth and fifth centuries B.C. are extremely simple and small, and it is not until the fourth, and especially the third, century B.C. that the richer Hellenistic art returned to the more elaborate style of design. The Etruscan tombs furnish the largest number of examples for the early part, those of southern Russia for the later part of this period. The museums containing the largest number are: the Gregorian Museum at the Vatican, the Campana Collection at the Louvre, the Castellani Collection at the British Museum, the Metropolitan Museum in New York—all of which have been gathered from the contents of Etruscan tombs—and the Hermitage Collection at Saint Petersburg, with the superb series from southern Russia, especially from Kertch. They must be classified into two series: votive earrings, of very thin gold and frail workmanship, made only for burying with the deceased; and earrings for use, of heavier workmanship. The Etruscan tombs contain earrings that are both Italian and Greek—it is not easy to distinguish them. They form the most numerous and continuous series of ancient times, giving the styles during about six hundred years. The material is gold, embossed, with filigree and granulated work, of the famous technique which modern jewelers, headed by the great antiquarian artist, Castellani, have tried to revivify. The main Etruscan designs are the following: The hand-bag shape, formed of a plaque with handle, decorated with spirals, granulations, balls or figured designs, linear or in relief—an early form, seventh century; the gondola shape, with a bunch of three drops decorated with little groups of pearls, popular in the sixth century; the ear-plaque, a disk usually circular, but sometimes oval, square, or oblong, with borders and zones of ornamental designs in relief and filigree and with its pendent bunch of drops, as in the previous kind used in the fifth and fourth centuries; the ring with pendant, usually large and sometimes with a diminishing series of single drops, a style frequent in the latest tombs of the fourth and third centuries. Some unusual specimens do not belong to any of these types. An exquisite pair of late workmanship from Bolsena, now in the Louvre, has for its central piece a vase, surmounted by Apollo as sun-god, drawn by four horses in a chariot, and accompanied by winged Victories; its artistic beauties are to be seen only under a magnifier. Another beautiful pair from southern Russia, among the many at Saint Petersburg, has as centre a circular plaque with a Nereid on a Triton in relief. Such elaborate works have a profusion of hanging figurines, flowers, fruits, birds, vases, chain-nets, and their gold-work is often enhanced by colored enamels. The late-Greek artists in the service of the kings of the region of the Bosporus, whose works abound in southern Russia, appear to have excelled all others. Both Greek and Roman statues exist with the lobes of their ears bored for earrings—as in the Medici Venus.

ROMAN. The Romans naturally inherited the taste from the Etruscans and later borrowed forms from late-Greek art. Pliny says (xi.

50) that there was no part of dress on which greater expense was lavished; and Seneca mentions one worth a patrimony, consisting of four pearls above and below a central precious stone. Roman artists popularized for the first time the use of precious stones in earrings. It was characteristic that they valued them, not as the Greeks had, for beauty or workmanship, but for the value of the material. Roman earrings were therefore much less artistic, and jewels—especially pearls and emeralds—replaced gold almost entirely, excluding the old methods and designs entirely. This decadence was accentuated during the later Empire. It is interesting to note that the Roman poets and writers speak of distinguishing an Oriental man by his use of the earring.

BYZANTINE AND BARBARIC. Proof that it still remained the custom in the East for the men to wear earrings even later, is given by several Byzantine works of art, such as the mosaics representing Justinian and Theodora at Ravenna, and ivories of later Byzantine rulers, in which the emperors as well as the empresses wear earrings. The type of loop earrings and those with filigree-work were, however, perpetuated even through the Early Christian period, with ornaments of spirals and pellets, bands, circles, and even birds, found in Egyptian, Italian, and other tombs. The barbarous tribes of the North, who destroyed Roman civilization, varied in their use of the earring. The Goths, coming from farther east, were partial to them, with heavy gold and enamel designs; and in this they were somewhat rudely imitated by the Lombards. The Merovingian Franks affected a simple ring, with one or more stones set in the centre. But the Anglo-Saxons hardly used any. Many, however, are found in the early graves of Belgium, France, Rhenish and Bavarian Germany, and especially Hungary, although none approach the beauty of classic or Etruscan design. Cloisonné enamel was a novelty in technique, introduced by these northern jewelers.

INDIA. It is an interesting fact that late-Greek designs appear to have been perpetuated in Indian jewelry. In Cashmere and the Punjab, the style with gems and enamels, in Tibet that with heavy gold forms, in the region of Orissa and in other northern provinces, the filigree and granular work. Indian earrings are the most gorgeous and artistic perpetuation in recent times of the ancient styles. At the same time the ancient designs of Assyria and Phœnicia are in part perpetuated among the modern Arab and Syrian tribes.

THE RENAISSANCE. The Middle Ages in Europe abandoned the earring in the circle of high life, the custom being perpetuated only by the peasantry. The innumerable works of art reproducing the costume of the period between the tenth and fifteenth centuries show hardly a single earring. The change of taste came during the Renaissance, especially on the approach of the sixteenth century. The Italian jewelers furnished models for nearly all Europe, and the technique reverted to gold-work with frequent use of enameling and precious stones. The pendant type was universally employed, of many shapes, based on the circle, the cross, the heart, the drop. There was every variety of style, from heavy embossed work in solid metal, often with figures in high relief, to the even more favorite form of lace-like openwork in the rather regular geometric patterns of Renaissance design, with occasional free use of foliage and flowers, though never so realistic as in ancient jewelry. Portuguese, Spanish, German, French, and English work of the sixteenth and early seventeenth centuries, while based on Italian originals, developed national characteristics; and this style, sinking into the middle and peasant classes, has been perpetuated by them, alongside of even more antique patterns up to the present time. It was among the jewelry of the peasants of modern Tuscany that Castellani found the lost secrets of the Etruscan jewelers. The so-called peasant jewelry of Europe, as first shown by the Paris Exhibition of 1867 (now in South Kensington Museum), presents the only modern characteristic work comparable to that of modern India in regard to earrings as well as other branches of the art. It is an interesting fact that in many primitive parts of Europe—the Basque Provinces, Brittany, and Normandy, southern Italy—the men as well as the women wear earrings, but usually in the form of simple rings.

EAR-SHELL, or ORMER. See ABALONE.

EARTH, THE (AS. *eorþe*, Icel. *jörþ*, Goth. *airþa*, Teut. *Hertha*, OHG. *erde*, Ger. *Erde*, earth; connected with Gk. ἔρα-ζε, *era-ze*, on the ground. and possibly with Lat. *arvum*, field, *ararc*, Gk. ἀροῦν, *aroun*, OChurch Slav. *orati*, Ir. *araim*, Goth. *arjan*, Icel. *erja*, OHG. *erian*, dialectic Ger. *ären*, *eren*, AS. *erian*, archaic Eng. *ear*, to plow). The planet on which we live, the third in order of distance from the sun, and the largest within the orbit of Jupiter.

THE FORM AND THE MAGNITUDE OF THE EARTH. To a spectator so placed as to have an unobstructed view in all directions, the earth appears a circular plain on whose circumference the vault of heaven seems to rest. In ancient times, even philosophers looked upon the earth as a flat disk swimming upon the water. But many appearances were soon observed to be at variance with this idea, and even in antiquity the curved form of the earth began to be suspected. It is only by assuming the earth to be curved that we can explain how our circle of vision becomes wider as our position is more elevated, and how the tops of towers, mountains, masts of ships, and the like, come first into view as we approach. There are many other proofs that the earth is a globe. Thus, as we advance from the poles toward the equator, new stars, formerly invisible, come gradually into view; the shadow of the earth upon the moon during an eclipse is always round; the same momentary appearance in the heavens is seen at different hours of the day in different places on the earth's surface; and lastly, since 1519, the earth has been circumnavigated innumerable times. It is not, however, strictly true that the earth is a sphere; it is slightly flattened or compressed at two opposite points—the poles—as has been proved by actual measurement of degrees of latitude (q.v.) and by observations of the pendulum. It is found that a degree of a meridian is not everywhere of the same linear length (see DEGREE OF LATITUDE), which would be the case if the earth were a perfect sphere, but increases from the equator to the poles, from which it is rightly inferred that the earth is flattened there. A pendulum, again, of a given length is found to move faster when carried toward the poles, and more slowly when carried toward the equator;

which shows that the force of gravity is less at the equator than at the poles, or, in other words, that the centre is more distant at the former than at the latter. The diminished force of gravity at the equator has, it is true, another cause—namely, the centrifugal force arising from the rotation of the earth, which acts counter to gravitation, and is necessarily greatest at the equator, where the linear velocity of rotation is greatest, and gradually lessens as we move northward or southward, till at the poles it is nothing. But the diminution of the force of gravity at the equator, arising from the centrifugal force, amounts to only $\frac{1}{289}$ of the whole force; while the diminution indicated by the pendulum is $\frac{1}{190}$. The difference, or $\frac{1}{555}$ nearly, remains assignable to the greater distance of the surface from the centre at the equator than at the poles. From the most accurate measurements of degrees that have been made, the flattening or ellipticity of the earth has been determined at $\frac{1}{300}$ nearly; or the equatorial radius is to the polar as 300 to 299. These measurements of degrees determine not only the shape, but also the size of the earth. It is thus found that the equatorial semi-diameter amounts to 3963 miles, while the polar semi-diameter is 3950 miles.

THE MASS AND DENSITY OF THE EARTH. There are several methods of weighing the earth: (1) The first method is by observing how much the attraction of a mountain deflects a plummet from a vertical line. This being observed, if we can ascertain the actual weight of the mountain, we can calculate that of the earth. In this way Maskelyne, in the years 1774-76, by experiments at Schehallien, in Scotland, a large mountain mass lying east and west, and steep on both sides, calculated the earth's mean density to be five times greater than that of water. The observed deflection of the plummet in these experiments was about six minutes. In the method just described there must always be uncertainty, however accurate the observations, in regard to the mass or weight of the mountain. (2) The method known as Cavendish's is much freer from liability to error. This method was first employed by Henry Cavendish on the suggestion of Michel, and has since been repeated by Reich, of Freiburg, and by Baily. In the apparatus used by Baily, two small balls at the extremities of a fine rod are suspended by a wire, and their position carefully observed by the aid of a telescope. Large balls of lead placed on a turning frame, the centre of which is in the prolongation of the suspending wire, are then brought near them in such a way that they can affect them only by the force of their attraction. On the large balls being so placed, the small ones move toward them through a small space, which is carefully measured. The position of the large balls is then reversed—i.e. they are placed at the same angular distance on the other side of the small balls—and the change of the position of the small balls is again observed. Many observations are made, till the exact amount of the deviation of the small balls is ascertained beyond doubt. Then by calculation the amount of attraction of the large balls to produce this deviation is easily obtained. Having reached this, the next question is, What would their attraction be if they were as large as the earth? This is easily answered; and hence, as we know the attractive force of the earth, we can at once compare its mean density with that of lead. Baily's experiments lead to the result that the earth's mean density is 5.67 times that of water. (3) A third mode, tried by Airy, consisted in observing two invariable pendulums, one at the earth's surface, the other at the bottom of a pit at Harton Colliery, near Newcastle, 1260 feet below the surface. The density of the earth, as ascertained from this experiment, is six to seven times that of water; but, for various reasons, this result is not to be accepted as against that of the Cavendish experiment, and it is said that Airy himself was dissatisfied with it, and meant to repeat the experiment with new precautions. The most recent determination of the earth's density was made by Wilsing, at Potsdam, using a method not dissimilar from Cavendish's. Wilsing found 5.59 as his final result. The density of the earth being thus known, its mass or weight is easily calculated and made a unit for measuring that of the other bodies in the solar system.

THE MOTIONS OF THE EARTH. The earth, as a member of the solar system, moves along with the other planets round the sun from west to east. This journey round the sun is performed in about 365¼ days, which we call a year (solar year). The earth's path or orbit is not a circle, but an ellipse of small eccentricity, in one of whose foci is the sun. It follows that the earth is not equally distant from the sun at all times of the year; it is nearest, or in perihelion, at the beginning of the year, or when the Northern Hemisphere has winter; and at its greatest distance, or aphelion, about the middle of the year, or during the summer of the Northern Hemisphere. The difference of distance, however, is too small to exercise any perceptible influence on the heat derived from the sun, and the variation of the seasons has a quite different cause. The least distance of the sun from the earth is over 91,000,000 miles, and the greatest over 94,000,000; the mean distance is commonly stated at 92,900,000 miles. (See PARALLAX, SOLAR.) If the mean distance be taken as unity, then the greatest and least are respectively represented by 1.01677 and 0.98323. It follows that the earth yearly describes a path of upward of 560,000,000 miles, so that its velocity in its orbit is about 19 miles a second.

Besides its annual motion round the sun, the earth has a daily motion or rotation on its axis, which is performed from west to east and occupies exactly 23 hours, 56 minutes, 4.090 seconds of ordinary mean solar time. On this motion depend the rising and setting of the sun, or the changes of day and night. The relative lengths of day and night depend upon the angle formed by the earth's axis with the plane of its orbit. If the axis were perpendicular to the plane of the orbit, day and night would be equal during the whole year over all the earth, and there would be no change of seasons; but the axis makes with the orbit an angle of 23.5°, and the consequence of this is all that variety of seasons and of climates that we find on the earth's surface, for it is only for a small strip (theoretically for a mere line) lying under the equator that the days and nights are equal all the year; at all other places this equality only occurs on the two days in each year when the sun seems to pass through the celestial equator—i.e. about March 21st and September 23d. From March 21st the sun departs from the equator toward the north, till, about June 21st, he has reached a northern declination of 23.5°, when he again approaches the equator, which he reaches about September 23d. He then advances southward, and about December 21st has reached a southern declination of 23.5°, when he turns once more toward the equator, at which he arrives March 21st. The 21st of June is the longest day in the Northern Hemisphere, and the shortest in the Southern; with the 21st of December it is the reverse. The linear velocity of axial rotation at the earth's surface evidently increases gradually from the poles to the equator, where it is about 24,840 miles a day, or about 1440 feet in a second. A direct proof of the rotation of the earth is furnished by experiments with the pendulum, which, as we have already pointed out, show a decrease of the force of gravity from the poles toward the equator; and though a part of this decrease is owing to tne want of perfect sphericity, a part also arises from the centrifugal force caused by the motion of rotation. Another direct proof of rotation may be drawn from the observation that bodies dropped from a considerable height deviate toward the east from the vertical line. The analogy of our earth to the other planets may be also adduced as an argument, since their rotation, with the exception of the smallest and the most distant, is distinctly discernible. Finally, an additional proof of the earth's rotation was given in 1851 by Foucault's experiment with the pendulum. The principle of the experiment is this—that a pendulum once set in motion, and swinging freely, continues to swing in the same plane, while at any place on the earth the plane of the meridian continues to change its position relative to this fixed plane. This experiment, being tried, verified the expected rotation most satisfactorily.

If the turning of the earth on its axis is once admitted to be the cause of the apparent daily motion of the heavens, it is an easy step to consider the annual motion of the sun through the constellations of the zodiac as also apparent, and arising from that revolution of the earth about the sun which we have already mentioned. If we consider that the mass of the sun is about 332,000 times greater than that of the earth, and that by the laws of mechanics two bodies that revolve round each other must revolve about their common centre of gravity, the idea of the sun revolving about the earth is seen to be simply impossible. The common centre of gravity of the two bodies, being distant from the centre of each inversely as their respective masses, is calculated to be far within the body of the sun, which has a diameter of 866,400 miles. But it is easy to see how the apparent motion of the sun on the ecliptic naturally arises from a motion of the earth about the sun. The motions of the planets, also, that appear so complicated and irregular as seen by us, can only be satisfactorily explained by assuming that they, too, revolve round the sun in the same direction as the earth. See the articles PRECESSION and NUTATION for an account of a small periodic motion of the earth's axis and its effects.

THE EARTH'S TEMPERATURE. The phenomena of heat on the earth's surface are described under CLIMATE; METEOROLOGY; and other heads. As we go below the surface, we reach a depth beyond which the interior of the earth seems to have no sympathy with the external causes of heat or cold, and its heat appears to be its own, and to increase according to a fixed law the deeper we descend. The average rate of observed increase is 1° F. for a descent of between 40 and 50 feet. The distribution of the land and water surfaces, with their area, is discussed in the article GEOGRAPHY (q.v.). For the physical features of the earth, see GEOLOGY.

BIBLIOGRAPHY. Burmeister, *Geschichte der Schöpfung* (7th ed., Leipzig, 1872); Kirchhoff, *Unser Wissen von der Erde* (ib., 1886 et seq.); Hann, Hochstetter, and Pokorny, *Allgemeine Erdkunde* (ib., 1896-99); Ratzel, *Die Erde und das Leben* (ib., 1901 et seq.); Shaler, *Aspects of the Earth* (New York, 1889); Humboldt, *Cosmos* (new ed. London, 1889); Reclus, *The Earth and Its Inhabitants* (trans. ed. by Keane and Ravenstein, London, 1890-95); the Atlases of Physical Geography of Alexander Keith Johnston, Bartholomew, and Berghaus; Habenicht, *Grundriss einer exakten Schöpfungsgeschichte* (Leipzig, 1896); Newcomb, "Tables of the Motion of the Earth on Its Axis Around the Sun," in *Astronomical Papers*, vol. vi. (Washington, 1895); *Neumayr, Erdgeschichte* (Leipzig, 1895), and Reade, *Evolution of the Earth's Structure* (New York, 1903).

EARTH-CHEST'NUT. See EARTHNUT.

EARTH-EATING. The practice of eating clay. See GEOPHAGY.

EARTHENWARE. See POTTERY.

EARTH-HOG, or PIG. A name for the AARDVARK (q.v.).

EARTH LODGE. A domicile of earth, or within the earth. The middle-latitude Amerind tribes made typical earth lodges for winter use. The Caddoan, Siouan, and Athapascan domicile for the winter was constructed by making an excavation from two to four feet deep, within which a framework of poles was erected. This was covered with grass or shrubbery and the excavated earth was heaped over all. The entrance was a long covered way. Among the California tribes there was a corresponding type, though placed deeper in the earth and with a proportionately longer covered entrance. This building was used as a 'medicine' lodge, i.e. a temple, or place for sacred ceremonies. In southern California and throughout the arid region generally a single domicile usually served both for winter and summer use. This was commonly built of grass or cones or wattled shrubbery supported by a framework of poles, but a trace of the more primitive form survived in a roof-covering of earth and sometimes in a plastering of mud with imbedded pebbles. This latter type is of much interest as a precursor of the pisé type in which American aboriginal architecture may be said to have culminated. The pebble-set plastering was thickened, then the pebbly mud was rammed between two wattled walls. As a further development the wattling was reduced to movable screens between which successive ledges of rammed earth were built up and permitted to set by drying; while the earthen roof gradually became a resting-place, then a refuge as the walls developed into parapets, and eventually an upper floor when the parapet had become a full story. This perfect type of earth lodge coexists with the essentially primitive neighboring type. Earth lodges abound also in the middle latitudes of South America, as well as in many parts of Asia and Europe. Tacitus (*Germania*, xvi.) speaks of earth lodges among the Germans. Subterranean galleries exist in those parts of Scotland, Ireland, and England where Gaelic speech is prevalent. Hence these prehistoric remains are thought to have been of Celtic origin. They consist of a principal chamber, often with rooms on the sides and reaching the depth of fifty feet or more. The walls are said to be of stones laid up dry and the roofs of slabs are often not more than a foot beneath the surface. Relics of Roman origin are found in some, and it cannot be positively affirmed who built them. Whole cities in Russia are under the ground.

In Japan, especially in the north, and in Korea, earth lodges were formerly in use. One of the most interesting phases of this type of habitation culminates in the dome-shaped snow hut of those Eskimo who live away from any timber-supply. Across the northern portion of the earth the tribes live under sod a part of the year. These subterranean abodes are built of wood and covered with earth. In Arctic America, where driftwood abounds, the Eskimo make a strong framework of logs over which earth is heaped. The chambered tomb or dolmen is merely the earth lodge for the dead; the snow dome, prototype and forerunner of the most imposing architectural feature, is the climax of the earth lodge for the living.

EARTHLY PARADISE, The. A series of narrative poems by William Morris, modeled on Chaucer's *Canterbury Tales* and published in 1868-71. The separate poems are mythological stories told by Norwegian voyagers in search of an earthly paradise.

EARTHNUT. A popular name for the tubers of certain umbelliferous plants, particularly *Carum bulbocastanum* and *Conopodium flexuosum*, which are common in most parts of Europe. Names of the same signification are given to them in a number of European languages. Pignut is another common English name, because pigs are very fond of them. They are also called earth-chestnut, from their resemblance in taste and qualities to chestnuts. They are wholesome and nutritious, and form an article of trade in Sweden, and have sometimes been recommended as worthy of more attention than they have yet received. *Carum ferulæfolium* likewise affords tubers, which are used as food in Greece. The somewhat similar tubers of other umbelliferous plants, as *Œnanthe pimpinelloides* and *Chærophyllum tuberosum*, are sometimes also used for food. The name earthnut is sometimes extended to other small tuberous roots of similar quality, although produced by plants widely remote in the botanical system, as *Apios tuberosa* and *Lathyrus tuberosus, Cyperus rotundus, Arachis hypogæa*, etc.

EARTHQUAKE. A term applied to any tremor or shaking of the solid crust of the earth due to natural subterranean concussion. Earthquakes vary in intensity from tremors so slight as to be observed only by the most delicate instruments, to violent destructive shocks. While the more violent shocks are not of frequent occurrence, except in certain localities, slight tremors are shown, by the delicate instruments now used, to be of surprising frequency. The earth is indeed anything but a *terra firma*. The succession of phenomena recorded in notable earthquakes is first a trembling, next a severe shock or several shocks in quick succession, and then a trembling, gradually, but rapidly, becoming insensible. Noises of sundry kinds usually precede, accompany, or succeed the earthquake. These have been likened to the howling of a storm, the growling of thunder, the clanking of iron chains, the rumbling of heavy wagons along the road, the shattering and crashing of enormous masses of glass, etc. Such noises are conducted through the ground, through the sea, or through the air. Through the ground they travel for the greatest distances; cases being known where they have traveled nearly 200 miles.

An earthquake begins at some point of subterranean shock, called the *centrum* or *focus*, and travels in waves, with gradually diminishing energy, in every direction from this point. It has been determined that these foci are commonly at depths of 8 or 10 miles below the surface, and rarely as deep as 25 or 30 miles. This determination is based on the fact that at the epicentum over the locus the shock is felt as a vertical movement, while away from this point the shock comes to the surface obliquely. The angle at which the shock emerges from the ground is determined by the results of the shocks on walls and buildings. With a number of such observations at various situations, the point of origin of the earthquake may be located. The earthquake shock is transmitted through rock in two waves: one, the compression wave, vibrating parallel to the direction of transmission; and the other, the distortion wave, vibrating normal to the direction of transmission. The former has the greater velocity. The waves are of small amplitude; the ground moves upward or downward, or obliquely, or horizontally, usually through a very small fraction of an inch, and seldom through a space of more than two or three inches. The destructiveness of the earthquake is dependent more on velocity than on amplitude of the wave-movement.

The velocity with which earthquake waves are propagated has been found to vary somewhat. This is more particularly the case, however, when the speed is measured within a radius of a few hundred miles from the origin. The rate of travel for earthquakes of slight intensity ranges from 1.5 to 6 kilometers per second. Recent investigations indicate that great earthquakes are propagated at fairly uniform rates and can be recorded by suitable instruments in all parts of the world. In general the waves coming from a great and distant disturbance are resolved into two groups, preliminary tremors of short amplitude and the large waves. The preliminary tremors travel more rapidly than the large waves, and the time of their arrival at any point precedes that of the large waves by an interval which increases progressively with the distance from their origin. From a study of earthquake records obtained in Japan and elsewhere, Prof. Omori of the University of Tokio found that the preliminary tremors of distant earthquakes are transmitted at an average velocity of 12.8 kilometers and the large waves at an average of 3.3 kilometers per second. By comparison of seismograph records it is now possible to trace an earthquake and its origin with considerable accuracy.

The structure and nature of the rocks through which the earthquake shock is transmitted have an effect on the transmission of earthquake waves, causing numerous deflections and delays. It has been noted that localized areas are sometimes not sensibly affected, while surrounding areas feel the movement. Also, shocks which are not felt at the surface have been felt in mines, and vice versa. When an earthquake occurs beneath the sea, the vertical movements of the sea-bed generate a great wave, commonly but erroneously called a tidal wave, which is propagated outward from the centre of shock and reaches the land after the arrival of the earth-wave. In the open sea this wave is so broad that it cannot be perceived; but when it reaches shallow water near the shore it rushes forward as an immense breaker, sometimes 60 feet or more in height, and overwhelms everything in its course. The sandy beach deposits and loose boulders are swept away, while inland the surface is strewn with débris. The velocity of these great sea-waves is much greater than the ordinary waves raised by the wind.

The extent of country affected by an earthquake shock depends on the violence of the shock and the geological structure of the region. Some earthquakes are local affairs, affecting but a limited area. The earthquake of Lisbon in 1755, which threw down the greater part of the city in six minutes, and caused the death of about 40,000 people, disturbed an immense area, it being felt in the Alps, Great Britain, in the Baltic, and in northern Germany; and at Algiers and Fez as severely as in Spain and Portugal; while the effects of the sea-waves were noticeable at much greater distances. The Charleston, S. C., earthquake of August 31, 1886, which threw down many buildings in the city, was observed from central Florida northward to southern New England, across New York to Ontario, Canada, and westward to eastern Louisiana, Arkansas, Missouri, and Iowa; an area 800 miles wide by 1000 miles from north to south. The two notable earthquakes of 1906, that of April 18 which destroyed San Francisco, and that of August 16 which desolated Valparaiso, and the earthquake of January 15, 1907, which partially destroyed Kingston, Jamaica, were all felt over wide areas. See SAN FRANCISCO EARTHQUAKE; VALPARAISO.

The question arises whether the shocks are transmitted along the crust of the earth or through the earth, i.e. along the circumference or along a chord. If the earthquake wave is transmitted through the crust, the wave coming around the earth one way ought to reach a distant point (not the antipode) earlier or later than the wave going around the earth the other direction. In other words, the instruments at any distant point ought to record two periods of disturbance from the same initial shock. This is found not to be the case. It is concluded, therefore, that the earthquake waves travel *through* the earth along chords of arcs rather than follow arcs in the circumference of the earth.

The geological effects of earthquakes are land-slips, fissures, faults, extravasations of water and mud, volcanic action, elevation and subsidence, the draining of springs, the opening of new springs, and the formation of sea-waves (tidal waves). While slight tremors occur in almost any part of the world, violent shocks are ordinarily confined to limited areas. As a rule, earthquake shocks are more frequent in volcanic districts, and particularly along the boundary between great elevations and depressions. But earthquake shocks are not confined to the volcanic areas alone. One large zone particularly liable to earthquakes encircles the earth. This belt includes the Mediterranean lands, the Azores, the West Indies, Central America, the Sandwich Islands, Japan, China, India, Persia, and Asia Minor. Moreover, earthquakes are not confined to continents. Many, perhaps the larger number of them, originate under the sea. The places in sea-bottoms where the water shows great variation in depth are particularly likely to experience earthquake shocks, as at the edge of the Tuscarora Deep. The earthquakes at these points have been found to be so destructive of cables that they are called by the cable authorities 'danger zones.'

In assigning causes for earthquakes, there is, of course, wide opportunity for differences of opinion, and for the formation of a variety of hypotheses. It is well established that certain earthquakes are the direct concomitants of volcanic action. Lava in eruption contains a large quantity of steam, which under certain conditions may cause violent explosion, hurling vast masses of lava into the air. Such violent explosions may even blow off the entire top of a volcano, as in the great explosion of Krakatoa in the Sunda Straits, where what was formerly land is now covered by 150 fathoms of water. These shocks have caused earthquakes whose effects have been felt over many miles. Again, the lava forcing its way through the crust of the earth may form fissures in the solid rocks, and undoubtedly leads to earthquake shocks. But other earthquakes are apparently not associated with volcanic action, and for these another explanation is necessary. A considerable amount of corrugation of the earth's crust has occurred, for which a number of causes have been assigned, secular cooling, change of oblateness, injection of igneous matter into the crust, change of physical condition, loss of water and gas, etc. Whatever the causes, it is certain that stresses have accumulated sufficiently to raise great mountain systems and bring about much deformation of the rocks of the earth's crust. It is reasonable to suppose that these stresses may at certain times and places accumulate to such an extent as to cause violent rupture, which would be felt as an earthquake shock. Indeed, such violent ruptures have actually been observed on a small scale in quarries and excavations, when a superincumbent load has been taken from rocks. The view is therefore commonly accepted by geologists that many earthquakes, perhaps even some of those associated with volcanic eruptions, are but incidents in the readjustment of the earth's crust to changing conditions of pressure, and, so far as geological results are concerned, are of extremely small significance as compared with the greater slow earth movements which have taken place in the past and are now taking place without violent shock. The effects of earthquakes in the destruction of life and property and the sudden changes of surface conditions have caused undue attention to be paid to them as agents modifying the form of the earth, while the great but slow crustal movements of which earthquakes are but incidents have been given but passing notice.

The instruments used in the study of earthquakes are of much interest. The seismograph (q.v.) automatically records the time, violence, and duration of exceedingly slight tremors. In some localities slight tremors have been found to be of daily occurrence, while in no part of the world are they altogether lacking. So delicate are these instruments that the pressure of a hand against a stone column on which they rest will instantly cause a variation of the pointer; the sag in the heart of a city during the heavy traffic hours of the day and the sag of valleys between hills during heavy rainfall are indicated. The centre of disturbance of any earthquake shock may be quickly located by comparing the records of time and violence of the shock in different observatories passed by the wave in its course, and then with a globe and pair of compasses determining the point from which a wave would reach all of these observatories at the times recorded. Also by connecting points of simultaneous arrival of the wave, a coseismal curve may be drawn; perpendiculars erected upon chords of this curve will pass through the epicentrum. This determination of the locus of an earthquake is of much economic importance.

Among memorable earthquakes of recent times may be noted that of Lisbon, November 1, 1755; that in Calabria in 1783; that which destroyed Caracas in 1812; that which destroyed Aleppo in 1822; that at Mount Ararat in 1840; those at Brusa, Asia Minor, in 1855; Naples, 1857; at Quito, 1859; Mendoza, Argentina, South America, 1860; Manila, 1863; in Peru, 1868; Manila, 1880; Valparaiso, 1880; Ischia, 1883; the earthquake phenomena accompanying the volcanic eruption of Krakatoa, 1883; Colchester, and the eastern counties of England, 1884; Malaga and Granada, 1884 and 1885; Charleston, 1886; Japan, 1891; Chilpancingo, Mexico, 1892; Quezaltenango, Guatemala, 1902; Northwest India, 1905; San Francisco, Cal., Valparaiso, Chile, 1906; and Kingston, Jamaica, 1907.

Bibliography. *Transactions* of the Seismological Society of Japan (Yokohama, 1880-90); Mallet, *The Great Neapolitan Earthquake of 1857* (London, 1862); Ewing, "Earthquake Measurement," in *Memoirs of the Science Department of the University of Tokio*, No. 9 (Tokio, 1883); Dutton, "The Charleston Earthquake of August 31, 1886," in *Ninth Annual Report, United States Geological Survey* (Washington, 1889); Milne, *Earthquakes and Other Earth Movements* (New York, 1886); Humboldt, *Cosmos* (London, 1865), and *Travels* (London, 1840); Fouqué, *Les tremblements de terre* (Paris, 1888); Dulton, *Earthquakes in the Light of the New Seismology* (New York, 1904); de Montessus de Ballore, *Les Tremblements de Terre* (Paris, 1906); Kikuchi, *Recent Seismological Investigations in Japan* (Tokio, 1904); *Publications* of the Earthquake Investigation Committee (Tokio, 1902, etc.).

EARTHS. The oxides of a number of elements which are not easily reduced to a metallic state. The alchemists applied the term in general to bodies that were insoluble or only slightly soluble in water, and not changed by heat. With the establishment of modern chemistry by Lavoisier, the earths, which had been regarded as elements, became recognized as compounds. The earths are widely disseminated throughout the mineral kingdom. The term 'alkaline earths' is applied to the oxides of barium, calcium, and strontium, and sometimes to that of magnesium.

EARTHSHINE. The reflection from the moon of the light cast upon her by the earth, particularly noticeable on clear nights at the time of new moon, when sometimes the whole surface of the moon can be seen in ashy-colored light.

EARTH-SNAKE. See Shieldtail.

EARTH-STAR (translation of Neo-Lat. *Geaster*, from Gk. *γῆ*, *ge*, earth + *ἀστήρ*, *astĕr*, star). A genus of puffballs which, at the time of spore-dispersion, open in a star-like form. Before the period of spore-dispersion the earth-star has a rounded or pear-shape form, seldom more than two inches in diameter. When the spores are ripe the outer leathery layer of the skin, or periderm, splits radially from the central apex into a number of triangular segments, which expand like the petals of a flower to assume a star-like arrangement and then become strongly reflexed. In certain species, particularly in *Geaster hygrometricus*, this periderm is very sensitive to humidity and dryness, with the result that the plant expands during moist periods and closes up during dry ones. Earth-stars are found in nearly all parts of the world, some species being restricted to particular regions, while others are cosmopolitan. In America they are quite common in pastures and open woodlands. See Basidiomycetes and Fungi.

EARTH-WOLF. A name for the Aard-Wolf (q.v.).

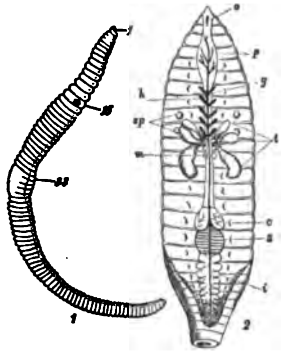
EARTHWORKS, Military. Shelter trenches made by soldiers in the field to protect themselves from the fire of the enemy. There are many forms of earthworks, for which see Fortifications; Redoubt; Trench.

EARTHWORM. The popular name for worms of the family Lumbricidæ, especially the common *Lumbricus terrestris* and *Allobophora fœtida*. They belong to the oligochætous section of the chætopod annelids, and are widely distributed in temperate and tropical lands.

Habits. Like most other oligochætes, earthworms are subterranean in their habits, and appear above the surface only under unusual conditions, such as excessive rain, which floods their underground burrows and forces them to the surface to avoid drowning. They also come to the surface to feed and to throw out their 'castings,' almost exclusively at night; for although they have no eyes, by primitive light-detecting organs they avoid the light. Earthworms are often seen in great numbers upon sidewalks, steps, and paved streets after a wet night or a hard rain, and they are often reported to have actually 'rained down.' Such cases, however, are easily explained by the fact that the worms crawl about actively in their attempt to get out of the water, and even climb up comparatively smooth surfaces, and as the hard surface of the sidewalk or roadway prevents their reëntering the earth when daylight returns, they are all left exposed to view. Although naturally somewhat sluggish, these worms can burrow with considerable speed, especially in light soil. The burrowing is accomplished not only by forcing the bluntly pointed head between the particles of earth and pressing them apart, but also by actually taking into the mouth and swallowing much of the opposing material. In all their movements, the short but stiff *setæ* or bristles along the sides of the body are of the greatest assistance. These setæ are arranged in pairs on each segment, two pairs on each side, so that every segment carries eight setæ, and they form two double, longitudinal rows along each side of the worm. Earthworms form the prey of many animals, from slugs upward, and form the principal food of moles, shrews, and the like. Their habit of going into the water, and the accidents of floods, cause many to fall a prey to fishes; and they are the commonest bait for still-fishing, whence they are more commonly known in the United States as 'angle-worms' than by any other name.

Earthworms and Soil. The important part that earthworms play in the economy of nature was not generally recognized until attention was called to it by Charles Darwin. Most of our knowledge of the habits of these creatures is due to him. Earthworms are vegetable feeders exclusively. In burrowing the worms take more or less earth into the alimentary canal, where it is mixed with the vegetable food of the worm, and nearly all of it passes out with the castings, which are always voided on the surface. These castings are therefore a sort of natural 'compost,' which the earthworms are continually distributing over the surface of the areas which they inhabit. They are thus not only constantly transforming vegetable matter into more usable forms, but are also so mixing it with inorganic matter as to make both of greater use. Such a process is called the formation of vegetable mold, and it is continually going on wherever the conditions are suitable. It is not, of course, confined to the agency of earthworms, though Mr. Darwin showed that they were one of the most important agents. The rate at which vegetable mold may be formed by these worms will vary of course with the character of the soil, the number of worms, and the abundance of food, but under favorable conditions it may be several inches in a century. Such soil is fertile not alone because of its composition, but because the movements of the worms keep it stirred up and well aërated. For further particulars in reference to the habits and usefulness of earthworms, consult Darwin, *The Formation of Vegetable Mould Through the Action of Worms* (London, 1881).

Structure. Earthworms are generally of a uniform color, although there is a difference in shading between the upper and under surfaces and between different regions of the body. The color is usually flesh-red, varying into dull pink on the one hand and dirty brown on the other. In size there is great diversity, some species reaching a length of only a few inches, while tropical species may be several feet in length. Large specimens of the common American species are rarely a foot long. In such specimens as many as 180 segments may be present, but 130 is about the average number. The muscular system of earthworms is well developed, and consists of an outer series of circular or transverse muscle-fibres which girdle the body, and an inner series of longitudinal fibres which form five principal bands, and several smaller ones concerned with the movements of the setæ. The nervous system consists of a large ganglion above the œsophagus, often called the brain, and a ventral cord, which lies beneath the alimentary canal, and bears ganglia in every segment. This cord is connected with the brain by commissures around the œsophagus. So far as known, there are no sense-organs other than those of touch. The alimentary canal consists of a muscular pharynx, a slender œsophagus, a muscular gizzard and thin-walled crop, and a long, straight intestine, within which is a complex dorsal fold, to increase the digestive surface. The circulatory system is well developed and consists of a prominent dorsal blood-vessel and no less than four ventral vessels, which run longitudinally in the body, and are connected with each other by a regularly arranged series of transverse vessels, many of which form a network of capillaries in the muscles and in the wall of the intestine. In some of the anterior segments some of these transverse vessels are much larger than elsewhere, and form very prominent arches, often called 'hearts,' of which there are usually five pairs. They are not functionally 'hearts,' however, or at least only in part, for most of the pumping is done by the dorsal trunk and general muscular movements. Excretion takes place through the very characteristic nephridia, of which there are a pair in each segment, one on each side of the intestine. They consist of coiled tubes, having at one end a funnel-shaped opening into the body-cavity, while the other end opens outside of the body. The funnel always opens into the segment just anterior to that in which the tube itself lies.



STRUCTURE OF AN EARTHWORM.

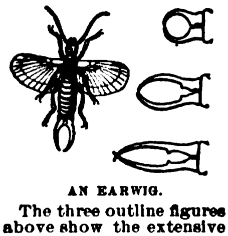
1. An entire worm, side view; 1, 1st segment and mouth; 15, 85th segment, showing opening of male genital ducts; 33, 33d segment and thickened 'clitellum.' 2. Anterior portion of *Lumbricus terrestris*, laid open and enlarged; *o*, mouth: *p*, pharynx; *g*, gullet; *m*, œsophageal glands; *c*, proventriculus; *s*, gizzard; *i*, intestine; *h*, one of the 'hearts' borne on the side of the dorsal vessel; *t*, seminal reservoirs; *sp*, spermathecæ. (After Lankester.)

Reproduction. Earthworms are hermaphroditic—that is, both male and female reproductive organs occur in the same individual. But mutual cross-fertilization probably always takes place. The eggs are laid in capsules which are buried in the earth and serve to protect the young until they are well developed. These capsules are probably formed from the secretion of the *clitellum*, a peculiar thickening of the body-wall, between the twenty-ninth and thirty-fifth segments. The clitellum is generally a very prominent band, forming one of the most noticeable of the external features of an earthworm, but it is not always evident. The eggs of earthworms contain considerable yolk, and the young worms develop without any metamorphosis.

Consult Beddard, "Earthworms and Leeches," in vol. ii., *Cambridge Natural History* (New York, 1896).

EAR-TRUMPET. A contrivance for improving the hearing of the partially deaf, and, as its name implies, a trumpet-shaped tube, whose action depends on the principles of reflection. The waves of sound strike the bell of the trumpet and are reflected into the narrower portion of the tube. As the waves proceed, the wave-front narrows in breadth, but increases in intensity and the sound reaches the inner ear magnified. In a great number of cases of impaired hearing, there can be no doubt that much assistance is obtained from the use of the ear-trumpet; still it must not be used indiscriminately, for in unsuitable cases it may do much mischief, both in increasing the deafness and aggravating the noises in the head from which deaf persons often suffer so much. It also possesses the great disadvantage of magnifying certain sounds at the expense of others. The ear-trumpet, on account of its shape, acts as a resonator, and will strengthen and increase the vibrations of certain frequencies, while others will be almost destroyed. Ear-trumpets are of most use, perhaps, in advanced cases of nervous deafness, though injurious in the early stages of this complaint; they are hurtful also in all acute diseases of the ear, and of little or no use in those cases of great thickening of the contents of the middle ear, where the adapting power of the organ has been lost. Most of the small and so-called invisible ear-trumpets are considered practically useless. All of the useful instruments have good-sized bowls, which in some cases rest against the temple when inserted in the ear, thus aiding the hearing by bone conduction. Another variety, applicable to the more severe cases of deafness, consists of an elastic tube, one end of which is tipped with ivory and is placed in the ear of the patient; the other is held in the hand of the speaker, who applies his mouth to the open extremity. Ear-trumpets are generally made of some thin metallic substance, such as tin. Gutta-percha and other substances are also frequently used. See AUDIPHONE.

EAR-WAX. See CERUMEN.



AN EARWIG.

The three outline figures above show the extensive variability of the 'tail-forceps' of the male of a single species (*Forficula auricularia*.)

EARWIG (AS. *ēarwicga*, from *ēare*, Eng. *ear* + *wicga*, insect; connected with AS. *wicg*, horse, *wiht*, wight, from *wegan*, Icel. *vega*, Goth. *gawigan*, OHG., Ger. *wegan*, to carry, move; connected with Lat. *vehere*, OChurch Slav. *vešti*, Skt. *vah*, to carry, Gk. *ἔχειν*, *echein*, to hold). A popular name for orthopterous insects of the family Forficulidæ, resembling rove-beetles, but easily distinguished from them by the presence of pincer-like processes at the posterior end of the abdomen. They probably owe their name to the foolish belief that they creep into the ears of sleepers. Earwigs are common in the United States only in the Southern States and on the Pacific Coast. They are fond of moist situations, such as under the decayed bark of trees, under stones, among old straw, etc. They are nocturnal in habit, and while their food is chiefly vegetable, such as flowers and ripe fruit, they probably do much good by destroying numbers of thrips, aphids, etc. The name is also applied in the United States to several small centipedes which frequent houses.

FOSSIL EARWIGS. The earliest known ancestor of the earwigs, a fossil genus (Baseopsis) from the Liassic rocks of Schambelen, Switzerland, is considered an interesting link connecting the Orthoptera and Coleoptera. Another Mesozoic genus is known in the Solenhofen limestones of Bavaria. Tertiary earwigs have been found in the amber of northeastern Prussia, in the beds of Aix, France, and Oeningen, Germany, and eleven species are known in the Oligocene shales of Florissant, Col. These latter include some very large species with unusually large eyes. See ORTHOPTERA.

See bibliography under ORTHOPTERA; also de Bormans and Krauss, "Forficulidæ and Hemimeridæ," in *Das Tierreich*, ii. Lieferung (Berlin, 1900).

EAR-WORM. The bollworm (q.v.). Also the cotton-worm. See COTTON-INSECTS.

EASEL (Dutch *ezel*, OHG. *esil*, Ger. *Esel*, Goth. *asilus*, AS. *esol*, *eosol*, from Lat. *asinus*, ass). A wooden structure, usually of tripedal form, upon which an artist places his canvas or panels when painting. The canvas is placed at a convenient height by means of pegs upon which is set a tray or supporting board, holes being bored in the two forward legs of the structure at regular intervals for receiving these pegs. This is the easel still in common use, though perhaps of earliest invention. Other forms of the easel, more mechanical in contrivance, are employed for large canvases.

EASEMENT. An acquired right of use or enjoyment in the lands of another, which one may have by virtue of his ownership or possession of other land. Though limited in number, easements are of very frequent occurrence, and comprehend such well-known rights as rights of way, of light, of drainage, and the like. They belong to that large class of rights, falling short of ownership, in the lands of others (*jura in re aliena*), which, from the point of view of the land subjected to the use, are sometimes called servitudes. The Roman law distinguished two classes of servitudes, urban and rural, and developed a refined and highly elaborated body of rules to determine the conflicting rights of the owner of the burdened land and of the person entitled to the use thereof. (See SERVITUDE.) In the common-law classification of property rights, easements belong to the class of incorporeal hereditaments, so called because of the impalpable character of the rights referred to, as distinguished from the direct ownership of the land itself, and because, like other real property rights, they are inheritable with the lands to which they are appurtenant. They are limited in our system to real property, though the Roman law recognized servitudes in chattels, or movables, as well as immovables.

Though sometimes improperly used so as to include several varieties of rights *in alieno solo*, the easement proper is to be sharply distinguished: (1) from rights not acquired, but which flow directly from, and inhere in, the ownership of land, as the right to the uninterrupted flow of water in a water course, the right to the support of land in its natural state, etc., which are properly denominated *natural rights;* (2) from rights which do not consist in mere use, but which extend to the taking of something of value from another's land, as the right of pasturing cattle thereon, the right to mine coal or other minerals therein, and the like, which are known as *profits à prendre,* or, more briefly, as profits; (3) from rights of use which attach to a person as an individual and not as a property-owner, and which are commonly spoken of as easements *in gross* as distinguished from easements *appurtenant,* but which are, strictly speaking, only *licenses* to use the land of another; and (4) from rights of use which pertain to one as a member of the public, such as the right to use a highway on another's land or to use a private stream for purposes of navigation, and which are sometimes improperly called public easements. See NATURAL LAW; PROFIT; and LICENSE.

As thus limited and defined, the term easement describes only such a right of use as is appurtenant to a specific parcel of land to whose value and enjoyment it contributes. The right is, in fact, conceived of as belonging to the land, rather than to the owner thereof for the time being, and as burdening the land over which it may be exercised, and not the person having the actual possession thereof. Accordingly, the estate to which the right attaches is known as the dominant tenement, and the estate subject to the servitude as the servient tenement. It follows, also, that the easement is unaffected by any disposition which may be made of either estate. The servient estate is subject to it, into whosesoever hands it may come, and the right of use passes with the dominant tenement, whenever that is conveyed. It was formerly considered that it was necessary to make some reference to the incorporeal rights attaching to an estate, at the time of conveying it, in order that these might pass with it to the grantee, and hence the use of the phrase 'with the appurtenances' in modern deeds; but it has long been settled that these or any other apt words are wholly unnecessary to produce that effect.

Easements are classified at common law as *positive* (or *affirmative*) and *negative,* the former having reference to such as involved the physical use of another's land by going upon it or otherwise, as a right of way or of drainage; while the latter, as in the right to light or to the support of a party-wall, calls for no such physical encroachment. While convenient for some purposes, this distinction is superficial, and has no real significance, the duty of the owner of the servient tenement being in all cases purely negative—to refrain from so using his land as to interfere with the rights of the dominant tenement—and involving no obligation to repair or do any other affirmative act.

The infringement of an easement is commonly a nuisance, and may accordingly be abated, either by act of the party injured or by appropriate legal proceedings. (See NUISANCE.) If the infringement do not amount to a nuisance, it may be punished, like any other violation of a right of property, by an action of trespass, or, in some cases, of ejectment; and if the infringement be only threatened, or if the common-law remedy be inadequate to redress the injury committed, an injunction may be granted to restrain the acts complained of. (See EQUITY; INJUNCTION; TORT.) But an easement is a true property right, or right *in rem,* and is protected not only against the acts of the owner or possessor of the servient tenement, but against those of any person whatsoever, the same remedies being available in the one case as in the other. Where a right in the nature of an easement exists which is not thus protected, such as might arise by contract between two adjoining land-owners, this is a mere right *in personam,* a license, and not an easement or a property right at all. A contract, however formal, can never create a legal interest in land.

Easements may arise in three ways, the second and third of which are, by a legal fiction, mere forms or variations of the first. These are: (1) grant, or deed; (2) prescription; and (3) implication. The deed of grant has from the earliest period of the common law been the peculiar and appropriate instrument for the creation and transfer of an incorporeal interest in land, corporeal interests, such as freehold estates, being formerly conveyed only by the process known as livery of seisin, i.e. by an actual physical transfer of possession. By prescription is meant open and uninterrupted use and enjoyment from time immemorial, which, in the view of the law, created a presumption of a grant of the right claimed at some remote period of time. Formerly this presumption could be shown to be unfounded and the claim thus defeated, but in the United States, and for most purposes in England the presumption of a lost grant, as it is termed, is a pure fiction, and is no longer requisite to establish an easement by prescription. Easements by implication are such as arise from a legal presumption of the intention of the parties at the time a parcel of land is conveyed. Perhaps the best illustration of such an easement is what is known as a 'way of necessity,' which exists where one buys premises which are shut off on all sides by intervening land from access to the highway. Here the easement arises, not from the necessity of the case, but from a reasonable presumption that the grantor of the land-locked parcel intended to give with it a right of way over his remaining land.

Of these several ways of creating easements, the first is the most comprehensive. All easements may arise by grant, and some only in that way. In the United States it is generally considered that negative easements, such as the easements of light, of lateral support, and the like, cannot exist by prescription, though the contrary view is taken in England and in a few of our States. On the other hand, only a few classes of easements will arise by implication—such, that is to say, as involve a 'continuous and apparent' user of the premises affected, as an aqueduct or drain. There is much difference of opinion as to what easements are properly to be described as continuous and apparent, negative easements being included in some jurisdictions and excluded in others, and the decision being sometimes made to turn on the question whether a permanent structure, like a drain, was actually apparent and known to the parties at the time of the conveyance.

Easements may be lost or destroyed, either by release, by merger, by abandonment, or, in some cases, by destruction of the premises to which they attach. Merger occurs where the dominant and the servient estates become vested in the same person. Here the easement will not revive upon the subsequent conveyance of either of the estates to another person. It is not true, as is often said, that an easement may be lost by mere non-user. But if the non-user be under such circumstances as to show an intention to abandon the easement, the easement may be lost. Mere misuse of an easement is as inoperative to destroy it as non-user. Such a right must be exercised within narrow limits: nothing may be done by the dominant tenant which increases the burden upon the servient tenement; neither may he make any material change in the manner of exercising it; but the remedy for an excessive user of an easement is an action of trespass and not the forfeiture of the right which has been abused. It is not, however, an unlawful or excessive user of an easement to enter upon the servient premises from time to time for the purpose of repair and of keeping the easement in good working order, nor for the purpose of abating a nuisance which interferes with its enjoyment.

It is only where an easement is of an ephemeral or temporary character that it is lost by any injury to the premises. The destruction of a road by flood or earthquake does not affect the right of way which exists with reference to it. The person claiming the easement may, at his own cost, make whatever repairs are necessary to restore the way to its former condition. So, if a house having an easement of light be destroyed by fire, the easement is not lost, but revives on the rebuilding of the house. But easements of lateral support, such as those which attach to party-walls, are manifestly intended only for the houses which are supported by such walls, and the complete destruction of the premises has the effect of destroying the easements on both sides. Either party may thereupon rebuild on his own land at his own pleasure and without reference to his neighbor. However, if the party-wall is not completely destroyed, but is susceptible of repair or reconstruction, it may be restored by the party desiring to avail himself of the easement, at his own expense, and his right to the support of the wall continues as before.

The narrow range of the class of rights under consideration, the restrictions which the law imposes upon their creation and exercise, have been made clear by the foregoing explanation of their legal character and status. This jealous attitude of the law toward rights of this character is due to the fact that they always constitute an interference with the free exercise of his natural rights by the owner of the servient tenement. The easy creation and the indefinite multiplication of such rights would produce grave inconvenience and would seriously hamper the free alienation of real property. Hence the common law has still further restricted them by arbitrarily limiting their number. It is a maxim of the law that no novel easements can be created. Land-owners are limited to the kinds which have always been known, and which have previously been recognized by the courts as proper and convenient burdens upon land. Those already referred to—ways, lights, drains, watercourse, support to buildings—comprehend practically all, or nearly all, such rights as can be created. Attempts have been made to increase the number, but the courts have invariably refused to countenance such proposed additions to the list, as the right of access of wind to a windmill or a chimney, the right to an unobstructed view, etc. Such a right may, indeed, be conferred upon one man by another, but it remains a mere right *in personam*, a contract right, and does not become a burden upon the land of the grantor or an appurtenance to the estate of the grantee. The only exception to this principle is that furnished by the case of the 'equitable easement,' whereby a restrictive covenant affecting the use of land—as an agreement not to build within a certain distance of the street line—is enforceable in equity—not only against the maker of the covenant and his heirs, but also against his assigns who take title with notice of the understanding. But even this exception, important though it be, is limited to a narrow range of cases, in which the covenant sought to be enforced is purely restrictive in character and imposes no active duty upon the owner of the premises affected.

Analogous to easements in their effects, but differing fundamentally from them in character, are the rights which are loosely described as 'covenants running with the land.' It has already been stated that an easement cannot be created by covenant—which is only a contract under seal—but requires the ancient form of a grant. Interests, or estates, in real property, whether corporeal or incorporeal, are too important to be subject to creation or transfer by any but the most solemn legal forms. Hence a covenant affecting the use of land, like any other covenant, creates only a right *in personam*, a right of action on contract, and not an interest in the property itself. But if such right of action runs with the land, that is, if it binds any and everybody who becomes the owner of the land, and if, on the other hand, it is enforceable, not only by the person to whom the promise is made, but by everybody who becomes entitled to the promisee's land, it is evident that we have the substance if not the form of an easement. The method of enforcing the right is different, by an action in covenant instead of trespass, but the right, on the one hand, and the burden, on the other, are not otherwise distinguishable from those resulting from an easement. In a very limited class of cases, such rights, arising out of covenant, are recognized in our law. The essential conditions are: (1) that the covenant shall 'touch and concern' the land, that is, that it shall affect the use and condition of the premises; and (2) that there shall be privity of estate, that is, some such relation as that of landlord and tenant, between the parties. In other words, both parties must in a legal sense be owners of the property affected. Thus, if a tenant covenants to make a certain class of repairs, or to cultivate the land in a certain way, the right to enforce such covenant will pass to the landlord's assignee, and the obligation to perform it will be equally incumbent on the tenant's assignee as upon the original tenant who entered into the engagement. In a few American jurisdictions this principle has been extended to the case of the privity existing between the owners of a dominant and a servient tenement, respectively, so that a covenant by the latter to keep a private way over his land in repair for the benefit of the former would pass as a permanent burden with the land, but this extension of the common-law doctrine is not generally accepted in the United States nor in England.

There is, of course, no element of easement in the other class of cases to which the expression 'covenant running with the land' is applied—those, namely, where, there being no relation of privity of estate, a covenant for the benefit of a parcel of land, by whomsoever made, is enforceable by those to whom the land may pass by descent or otherwise, against the covenanting party. Here we have the exact reverse of what is erroneously termed an easement in gross—the latter being a right in land claimed by an individual in his personal capacity, and the former a right vested in the land, or in its tenant for the time being, against an individual. There being no servitude, there is no easement, which, as has been said before, requires both a dominant and a servient tenement. See INCORPOREAL; HEREDITAMENT.

The authorities are modern, the law on the subject of easements being of a very meagre character prior to the nineteenth century. Consult: Holland, *The Elements of Jurisprudence* (9th ed., New York and Oxford, 1900; Gale, *Easements* (7th ed., London, 1899); Goddard, *Easements* (6th ed., London, 1906); Innes, *Easements* (London, 1893); Washburn, *Easements* (6th ed., Boston, 1885); Jones, *Treatise on the Law of Easements* (Boston, 1898).

EAST AFRICA COMPANY, BRITISH. A commercial association, founded after the Berlin Treaty of 1885, to develop African trade in the territory controlled by the English.

EAST AFRICA COMPANY, GERMAN. A trading company, formed in 1885 to develop the African territory under German influence. It took over the rights of the Society for German Colonization, with Dr. Peters at the head.

EAST ANGLIA, aŋ'glĭ-ȧ. See ANGLIA, EAST.

EAST AURO'RA. A village in Erie County, N. Y., 17 miles southeast of Buffalo, on the Pennsylvania Railroad (Map: New York, B 3). It is noteworthy as the home of the Roycrofters, whose shop produces fine hand-made furniture and editions de luxe of current and standard books. Pop., 1900, 2366; 1905, 2448.

EASTBOURNE, ēst'bẽrn. A municipal borough and seaside resort in Sussex, England, situated on the coast between Hastings and Brighton, about three miles northeast of Beachy Head (Map: England, G 6). It is a well-built town, with broad, tree-lined streets, lighted by electricity. A fine esplanade two miles long skirts the shore. A large park and numerous smaller recreation grounds are maintained by the municipality. The town hall, erected in 1886, is a handsome building. Eastbourne was incorporated in 1883. It has established an excellent system of drainage, and a good water-supply from wells, which, combined with its healthful situation, have made it one of the most popular of south coast resorts. Its population has more than doubled since 1881. In 1901 it numbered 43,300.

EAST CAPE. The name of the easternmost headland of Asia (coast of Siberia). It is situated in latitude 66° 3′ N. and longitude 169° 44′ W., and is separated by Bering Strait from Cape Prince of Wales in America.

EAST'CHEAP (ME. *Estchepe*, east market, from AS. *ēast*, east + *cēap*, traffic). Originally an open space in which a market was held for the East of London. It was situated at the junction of several streets, the oldest and most important of which were the two great Roman roads, leading northwest and northeast out of London. These roads were known in Saxon times as Watling and Ermine streets, and met on the north side of London Bridge. On account of its situation on these roads, Eastcheap was famous at a very early date for its taverns; and the "Boar's Head at Eastcheap," of Shakespeare's Prince Hal and Falstaff, was probably thus known as early as the reign of Edward III. The name is still preserved in that of a small street, near the north end of London Bridge.

EAST CHICAGO. A city in Lake County, Ind., 23 miles southeast of Chicago, on the Pennsylvania, the Wabash, the Pere Marquette and other railroads, and on Lake Michigan. Manufacturing is the chief interest, and the industries include iron-mills, manufactures of chemicals, cement, electrical supplies, and agricultural implements, and lumber mills. The city is governed, under a charter of 1894, by a mayor and a unicameral council of six members. Pop., 1900, 3411.

EAST END. A thickly populated and poor district of London, east of the Bank of England.

EASTER (AS. *ēastre*, OHG. *ōstarā*, Ger. *Ostern*, from Teut. *Austrō*, goddess of spring; connected with Lat. *aurora*, Gk. ἠώς, *ēōs*, with AS. *ēast*, and ultimately with Gk. ἦμαρ, *hēmar*, dry, Lat. *ver*, spring). The festival of the resurrection of Christ, the principal feast of the Christian Era. From very early times it was observed with great solemnity. In the primitive Church it was one of the special days for the administration of baptism, and the Latin name of the octave or the Sunday following, *Dominica in Albis*, preserves the memory of the custom of the newly baptized wearing their white robes throughout the whole week. The faithful greeted each other with the kiss of peace and the salutation "Christ is risen," to which the response was, "He is risen, indeed." This custom is still kept up in Russia. In the Roman Catholic Church the festivities of Easter really begin on the preceding morning with the mass of Holy Saturday, in which the short first vespers of Easter are included—a trace of the times of primitive severity, when the mass of that day would have been celebrated at a later hour, all the people fasting absolutely. The popular observances, past and present, connected with the day are innumerable. The use of eggs in this connection is of the highest antiquity, the egg having been considered in widely separated pre-Christian mythologies as a symbol of resurrection. It is possible that here, as in other cases, the Church adopted and consecrated an earlier custom. This is almost certainly true of the Easter fires which formerly celebrated the triumph of spring over winter (see BELTANE); the 'blessing of new fire,' from which is lit the paschal candle (a huge taper which burns at solemn mass and vespers until Ascension Day), is a part of the ceremonies in the mass referred to above. Some of the mediæval customs, especially in France and Germany, were very quaint—for example, that which prevailed in several French cathedrals of a solemn game of ball played by the bishops, canons, and other dignitaries (described by Pater in one of his *Imaginary Portraits*); grave and rhythmical dances were performed at Auxerre as late as the fifteenth century and at Besançon as late as the seventeenth century, to the strains of the Easter sequence, *Victimæ paschali.* All these observances had a common purpose, the expression of joy in the resurrection. To the popular sports and dances (still maintained in some places, as at Constantinople, where the whole Greek colony celebrates the festival with the ordinary accompaniments of a fair in the Cemetery of Pera) were added farcical exhibitions, in which even the clergy joined in some places, reciting from the pulpit stories and legends calculated to excite laughter (*risus paschalis*) among the hearers.

The proper time for the celebration of Easter has occasioned no little controversy. In the second century a dispute arose on this point between the Eastern and Western churches. The great mass of the Eastern Christians celebrated Easter on the fourteenth day of the first Jewish month or moon, considering it to be equivalent to the Jewish Passover. The Western churches celebrated it on the Sunday after the fourteenth day, holding that it was the commemoration of the resurrection of Jesus. The Council of Nicæa (in 325) decided in favor of the Western usage, branding the Eastern with the name of the 'quartodeciman' heresy. This, however, only settled the point that Easter was to be held, not upon a certain day of the month or moon, but on a Sunday. The proper astronomical cycle for calculating the occurrence of the Easter moon was not determined by this council. It appears, however, that the metonic cycle (q.v.) was already in use in the West for this purpose; and it was on this cycle that the Gregorian calendar, introduced in 1582, was arranged. The time of Easter, being the most important of all the movable feasts of the Christian Church, determines all the rest. It was debated, at the time of the introduction of the Gregorian calendar, whether Easter should continue to be movable, or whether a fixed Sunday, after the 21st of March, should not be adopted. It was deference to ancient custom that led the ecclesiastical authorities to adhere to the method of determination by the moon. It must be remembered, however, that it is not the actual moon in the heavens, nor even the mean moon of astronomers, that regulates the time of Easter, but an altogether imaginary moon, whose periods are so contrived that the new (calendar) moon always follows the real new moon (sometimes by two, or even three, days). The effect of this is, that the fourteenth of the calendar moon—which had, from the times of Moses, been considered 'full moon' for ecclesiastical purposes —falls generally on the fifteenth or sixteenth of the real moon, and thus after the real full moon, which is generally on the fourteenth or fifteenth day. With this explanation, then, of what is meant by 'full moon,' viz. that it is the fourteenth day of the calendar moon, the rule is that Easter Day is always the first Sunday after the paschal full moon, i. e. the full moon which happens upon or next after the 21st of March (the beginning of the ecclesiastical year); and if the full moon happens upon a Sunday, Easter Day is the Sunday after.

One object in arranging the calendar moon was, that Easter might never fall on the same day as the Jewish Passover. They did occur together, however, in 1805, in 1825, and in 1903, on the 12th of April; and will do so again in 1923, on the 1st of April; in 1927, on the 17th of April; and in 1981, on the 19th of April. The Jewish Passover usually occurs in the week before Easter, and never before the 26th of March, or after the 25th of April (new style). On the other hand, the Christian festival is never before the 22d of March, or after the 25th of April. In 1761 and 1818 Easter fell on the 22d of March; but this will not be the case in any year of the twentieth century. The latest Easter in this century occurs in 1943, on the 25th of April.

EASTER ISLAND (so called because discovered by Roggeveen on Easter Day, 1772; also called *Waihu*, *Teapi*, and, by the natives, *Rapanui*). The most easterly of the inhabited islands of Polynesia, situated in the Pacific, in latitude 27° 20′ S., and longitude 109° 30′ W. (Map: World, Western Hemisphere, M 9). It is of volcanic origin, rising 1200 feet above the sea, and is moderately fertile, but almost destitute of water. It is triangular in shape, and has an area of about forty-five square miles. The most interesting feature is the multitude of rude stone statues, some of them of colossal size. The island has belonged to Chile since 1888.

The natives of Easter Island are the last outpost of the Malayo-Polynesian race, to which they belong by physical characteristics, language, arts, etc. The stone images, sculptured stones, petroglyphs, etc., are not beyond the known capacity of the Polynesians. The approximate meaning of the tablets has been given, probably with a fair degree of accuracy, by an aged native, and the statues are memorials of dead chiefs, though no worship seems to have been paid to the figures themselves, precise analogues being found among the Melanesians. Many theories have been put forward to account for their presence, but the study of similar remains in the Carolines, Tonga, Pitcairn, etc., may clear up the matter. The population of the island, by reason of missionary transference to Tahiti, and the Peruvian slave trade, has dwindled almost to extinction. It is estimated at 150. Consult: Geiseler, *Die Osterinsel: Eine Stätte prähistorischer Kultur* (Berlin, 1883); Thomson, "Te Pito Te Henua, or Easter Island," in the *Report of the United States National Museum* (Washington, 1891); Cooke, "Te Pito Te Henua," ib. (ib., 1899); Gana, Viaud, and Ballesteros, *La Isla de Pascua* (Santiago de Chile, 1903).

EASTER MACKEREL. See CHUB-MACKEREL.

EASTERN ARCHIPELAGO. See MALAY ARCHIPELAGO.

EASTERN BENGAL AND ASSAM. See BENGAL and ASSAM.

EASTERN CHURCH. See GREEK CHURCH.

EASTERN EMPIRE. See BYZANTINE EMPIRE.

EASTERN QUESTION. The complicated problem of international politics growing out of the relations of Turkey and the Balkan nationalities to the great Powers of Europe and to each other. The problem has occupied the attention of Europe, in more or less degree, since the second half of the eighteenth century, when the rapid curtailment of the Ottoman power through the Russian advance southward seemed to threaten the establishment of Russian supremacy in the southeast of Europe at the expense of Austria. In the beginning the decline of Turkey chiefly concerned only these two powers. Subsequently, however, the interests of Great Britain became more closely bound up with the fortunes of the Turkish Empire as the importance of the British possessions in India increased, and with it the necessity of preserving a safe and short line of communication between England and the Far Orient. France, too, was involved in the web of diplomacy, first and naturally, as one of the great powers, secondly because of its ancient connection with the Porte, and, thirdly, because of the developments resulting from the ambitious schemes of Mehemet Ali of Egypt. Germany, until the very last years of the nineteenth century, disclaimed all interest in the Eastern Question, but at that time German capital had not yet entered extensively into railroad and other business enterprises in Syria, which at present have resulted in establishing close relations with the Ottoman Government. The Eastern Question entered upon its modern phase in the Crimean War (q.v.), and assumed definite form at the Congress of Paris in 1856, whose work was slightly modified by the London Protocol of 1871. The opening of a new highway to the East by the Suez Canal and the English occupation of Egypt have helped to complicate the Eastern Question. A new phase of it developed when Russia began a war with Turkey in 1877. The new status created by this war, the full results of which Russia was not allowed to reap, was embodied in the treaty arrangements of the Congress of Berlin. This arrangement still holds, but considerable changes have taken place through the annexation of Eastern Rumelia to Bulgaria in 1885, the shifting of the boundary between Greece and Turkey as a result of the war of 1897, and the establishment of autonomy in Crete.

Though affairs in Eastern Asia have diverted attention from the Eastern Question proper, the problem is still a vital one and fraught with great importance to the future development of international relations. Russia still has her eye on Constantinople; Great Britain must still defend her position in Egypt; above all, Austria-Hungary must, in very self-preservation, retain her influence among the Slav peoples of the Balkans. The balance of adjustment at present is delicate, with Austrian influence predominant in Servia, with Russian influence powerful in Bulgaria, and Greece still anxious to restore, in some measure, the ancient Byzantine or Greek Empire. Consult: Holland, *Studies in International Law* (Oxford, 1898); id., *The European Concert and the Eastern Question* (Oxford, 1885); de Monicault, *La question d'orient* (Paris, 1898); Duggan, *Eastern Question* (New York, 1902); Villari, *The Balkan Question* (London, 1905); Barry, *At the Gates of the East* (London, 1906). See BULGARIA; GREECE; MONTENEGRO; RUMANIA; RUSSIA; RUSSO-TURKISH WAR; SERVIA; TURKEY; BERLIN, CONGRESS OF.

EASTERN RITE, CHURCHES OF THE. The name given to various bodies of Armenian, Coptic, Greek, and Syrian Christians, most of whom were formerly Nestorians or Eutychians, but who have acknowledged the supremacy of the Pope and returned into communion with Western Christendom. They have been allowed to retain some of their traditional usages, such as the use of the vernacular in public worship, communion in both kinds, and the permission of (a single) marriage to the clergy below the rank of bishop. They are under the special care of a section of the Propaganda created by Pius IX. in 1862, called *Super Negotiis Orientalium*. Among these branches of Roman Catholics there are about eighty bishops, of whom five are patriarchs, and fifteen archbishops.

EASTERN RUMELIA. See RUMELIA, EASTERN.

EASTERN SHORE. A name given to the counties of Accomac and Northampton in Virginia, and to all of Maryland lying east of Chesapeake Bay, and sometimes including Delaware also. It is a fertile region, famous for peaches and garden vegetables, and equally famous for oysters. The country, though low and level, is generally healthful, and the climate is mild and equable. It is intersected by railroads, only a single line, however, running the length of the Virginia peninsula. There is convenient steamboat navigation. Until invaded by railroads, and divided up into small ownerships, the southern was the 'blue-blood' section of Virginia, the leading inhabitants being noted for their aristocratic tendencies and hospitality.

EASTER TERM. One of the four regular terms of the courts of common law in England. It was formerly dependent upon the movable feast of Easter, and was hence called a movable term. It commenced on the Wednesday fortnight after Easter Sunday, and lasted till the following Monday three weeks. It was at a later period converted by act of Parliament into a fixed term, beginning on the 15th of April and ending on the 8th to the 13th of May in every year. If any of the days between the Thursday before and the Wednesday after Easter fall within term, no sittings in banc (q.v.) are held on those days, and the term is prolonged a corresponding number of days. See TERM, OF COURT.

EAST GREENWICH, grĭn'ĭj. A town and the county-seat of Kent County, R. I., 13 miles south of Providence, on the New York, New Haven and Hartford Railroad, and on Greenwich Bay, a branch of Narragansett Bay (Map: Rhode Island, C 3). There is a good harbor; also a public library; and the town has a cotton bleachery, dry salter works, and manufactures of dextrine, cotton, and yarn. Pop., 1905, 3218.

EAST HAM. See HAM, EAST AND WEST.

EASTHAMPTON. A town, including three villages, in Hampshire County, Mass., situated in the valley of the Connecticut, four and three-quarters miles south by west of Northampton, on the New York, New Haven and Hartford, and the Boston and Maine railroads (Map: Massachusetts, B 3). The manufactures include rubber and elastic goods, buttons, shoe-web, cotton goods, and yarns. Easthampton has a public library, and the Williston Seminary, a well-known preparatory school for boys. The government is administered by annual town meetings. The water-works are owned and operated by the municipality. Easthampton was first settled in 1665, was incorporated as a district in 1785, and was organized as a town in 1809. It was the scene of an Indian massacre on May 13, 1704, in which 19 persons were killed. Population, 1900, 5603; 1905, 6808.

EAST HAMP'TON. A town in Suffolk County, N. Y., at the eastern end of Long Island, on the Long Island Railroad, 102 miles from New York (Map: New York, H 5). It is noted for its picturesqueness, and is a popular summer resort. It was the home of John Howard Payne. The building of Clinton Academy, incorporated in 1784, is now used as a library and town hall. At the neighboring Montauk Point, owing to the healthfulness of the situation, an army camp was established after the Spanish-American War. The government is administered by town meetings, held biennially. The town, settled in 1649, came under the jurisdiction of Connecticut in 1657 and under that of New York in 1664. During the Revolution it was frequently pillaged by the English. Pop. (town including part of Sag Harbor village), 1900, 3746; 1905, 4303. Consult: Hedges, *History of the Town of East Hampton* (Sag Harbor, 1897); Gardener, *Records of East Hampton* (ib., 1886-89).

EAST HART'FORD. A town in Hartford County, Conn., two and one-half miles east of Hartford, on the New York, New Haven and Hartford Railroad (Map: Connecticut, E 2). It has a town library, and the Raymond Library; and is engaged principally in paper-making, tobacco-growing, and market-gardening. There are also railroad shops. East Hartford was settled in 1640-50, and was incorporated in 1783. The government is administered by town meetings. Population, 1900, 6406; 1906 (local est.), 7200.

EAST HUM'BOLDT MOUNTAINS. A range of lofty mountains in Elko County, Nev., about fifty miles long, and extending from north to south (Map: Nevada, F 2). They are a northern continuation of the Ruby Mountains, and are well wooded. Fremont's Pass is in this range.

EAST INDIA ARMY. Originally, the troops in the pay and employment of the East India Company. They were largely natives, with a scattering of European adventurers, liberated convicts, and army deserters. Later a few regiments were raised in England, which since the Act of 1861 reorganizing the Indian army have been a part of the British regular army, under the army numbers of the 105th, 106th, 107th, 108th, and 109th Regiments of Infantry, and the Twenty-first Regiment of Hussars.

Before the Indian Mutiny in 1857, the army in the pay of the East India Company consisted of about 24,000 British regulars, lent from the English military establishment, but paid for by the company; 18,000 European troops, raised and drilled in England, but the property of the company; 180,000 native regulars; and 60,000 native irregular horse—about 280,000 in all. In 1861 the East India army ceased to exist, the Europeans joining the British Army, as before stated, and the native troop forming the nucleus of what is now the British Indian native army, for which see paragraphs on armies of the British Empire, under the title ARMIES.

EAST INDIA COMPANY. The name given to trading companies entrusted by various European governments with the monopoly of their trade with the East Indies. The most important one was the ENGLISH COMPANY, the original charter of which was obtained from Queen Elizabeth on December 31, 1600, granting for fifteen years the monopoly of trade with all parts of the world, not held by friendly European powers, between the Cape of Good Hope eastward to the Straits of Magellan. There were originally 125 stockholders, from whom were chosen each year the governor and twenty-four directors, to manage all the business of the company. The original stock was £72,000; indeed, the first voyages of the company were undertaken at the risk of such of the stockholders as would advance the requisite capital. In 1612 it was made a joint-stock company, with £400,000 capital. At the beginning of the eighteenth century, the stock had increased to three millions, and in 1853 it was valued at six.

At first the venture was esteemed to be of such a precarious nature that the company was aided by exemption from export duties, and in other ways. The first voyages, however, were highly successful, and the trade continued to increase, notwithstanding the bitter and often bloody struggles with foreign companies, the wealth of the Orient having attracted other European nations than the English. The Portuguese had a practical monopoly of the trade during the sixteenth century, but they made but sorry traders, being rather concerned with establishing an empire and spreading Catholicism. With them the whole trade was a royal monopoly. When Portugal was united with Spain under Philip II., nearly all its East Indian possessions were lost to the Dutch in the wars of the latter against Spain. The Dutch, who were traders only, looking for immediate returns, and being without far-sighted plans of future gains and empire, did not maintain their great advantage. In their struggle with the English Company, they indeed maintained their establishments in the Spice Islands, Sumatra, Java, Malacca, and elsewhere, and drove the English away, but they lost their possessions in India. Then came the most serious struggle between the English and the French company, the latter having been established in 1664. It began in 1745, and was not finally terminated until 1761. Victory fell to the English through the genius of Clive, which was almost matched by the Frenchmen La Bourdonnais and Dupleix. These wars caused the Europeans to mingle in the affairs of the native States, with the result that during the eighteenth century the English Company had become a great territorial power, and laid the foundations of the British Empire in India.

As a trading organization, it held for over two hundred years the practical monopoly of the trade of Great Britain with the Far East. The most important trade was with India and China, importing tea, pepper, spices, drugs, calicoes, silks, diamonds, etc. Its chief exports were the precious metals, for which reason the company was, from its inception, very unpopular at home. According to the current economic doctrine of the day, only that trade should be encouraged which found markets for English goods, and brought money into the country, thereby promoting the national welfare. It was urged in reply that more money came into England by the sale of Oriental goods than the company could possibly take away—reasoning which experience proved to be correct.

For this and other reasons, the stockholders often had difficulty in getting their charter renewed, having usually to pay for it by a loan to the Government, or some other service, although they usually succeeded in maintaining their monopoly. In 1650, and again in 1655, they absorbed rival companies, which had been incorporated under the Commonwealth and Protectorate. Indeed, in 1653, the experiment of free trade with India was tried, but proved a failure. After the Revolution of 1688, which, in the Declaration of Rights, maintained the right of interlopers to trade, the company experienced great difficulty in obtaining a Parliamentary charter in addition to the royal charter they already possessed. Parliament was opposed to monopolies on principle, and favored the admission of interlopers to the trade. The company maintained that the interlopers were quite irresponsible, and, if unsuccessful in trade, often took reprisals on the natives, and embroiled them with the latter. Nevertheless, a new general company, open to all individuals, was established in 1698. After bitter struggles and great confusion in the trade, both companies were united by act of Parliament in 1702. Every member holding over £500 of stock was entitled to from one to four votes, according to his holding, in the general court of proprietors, who elected the governor and a board of twenty-four directors from among the holders of not less than £2000 of stock. The directors were chosen for four years, six retiring each year.

Meanwhile the increasing political power of the company furnished endless opportunities for corruption among its servants in India, and for misrule and oppression of the natives. Its baneful influence in corrupting Parliament was well known. It was quite natural, therefore, that in 1769 a more complete control by the Government was established. In 1784 an act originated by the younger Pitt gave to the King the power of appointing a Board of Control over the civil and military, but not the commercial, acts of the company. In 1813 the trade with India was thrown open, the company maintaining its existence as a political body for the government of India only, and in 1833 its last great monopoly, the trade to China, was abolished, the dividends of the company being guaranteed by taxes levied on the India possessions. Its inability to cope with the terrible Indian revolt of 1857 gave Parliament reason for concentrating all its powers in the Imperial Government, which guaranteed a 10½ per cent. yearly dividend on £6,000,000 of its stock. Henceforth the East India Campany continued to exist as an organization for receiving and distributing these dividends only.

The Dutch East India Company was incorporated by the States General of Holland in 1602, with a capital of 6,600,000 florins. It was the union of several smaller companies which had been formed in consequence of successful voyages to the Spice Islands, beginning with 1595, when Philip of Spain closed the port of Lisbon to the Dutch. Its monopoly extended from the Cape of Good Hope to the Straits of Magellan, with sovereign rights in whatever territory it might acquire. The first expeditions (1602-05) were very successful, and resulted in permission from the native States to use a large number of ports, and to build a fortified factory in Java. In 1605 began the sixty years' war with Spain, at the end of which the Dutch Company had despoiled Portugal, which was then united with Spain, of all its East Indian possessions, and had supplanted the Portuguese in the Sunda and Molucca Islands, Ceylon, the Malabar Coast, Malacca, Japan, and the Cape of Good Hope. As a basis of their power the Dutch secured vast territorial possessions in the Sunda Islands, especially in Java, Sumatra, and Celebes, and in the Moluccas. They had other stations, but they were for trade only, and were unfortified. The most influential founder of the Dutch Indian Empire was Governor Jan Pietersz Coen, who, in 1619, established Batavia in Java as its capital. Hither came the ships from all the other stations, a centralization which enabled them to control the trade. In the insular possessions of the company the native governments were left in control, subject only to taxes and to the trade monopoly of the company.

Directed by practical merchants of experience, the company prospered. Between 1602 and 1696, the dividends were never less than 12 and sometimes as high as 63 per cent. The charter was renewed every twenty years, in return for financial concessions made to the State, to which the company in 1696 contributed 8,000,000 florins, in addition to 400,000 florins for the privilege of raising taxes. It was of far greater importance than any other company during this period. But in the eighteenth century came the decline, due to the control of the company by a few rich families, who used it as a means of immediate gain, and to its cruel conduct toward the natives, by which its territorial possessions came into great disorder. No dividends were paid after 1724. When the English attacked its possessions in 1780, on the pretext that Holland was about to join the league of neutrals in favor of America, the Dutch Company was incapable of resistance. It lost practically all of its possessions, and although most of them were returned to Holland by the treaty of 1815, in the meantime (1795) the company itself had been abolished and its possessions incorporated with those of the State, which also assumed its debts.

The French East India Company was established in 1664, during the reign of Louis XIV., through the instrumentality of Colbert, under the name of La Compagnie des Indes Orientales. Its original capital was 6,000,000 livres, afterwards increased to 15,000,000 of which the king subscribed 3,000,000. It was founded under favorable conditions, with almost complete sovereignty of the territory it might acquire, and with all possible protection from the French Government. It served the political purpose of operating against the powerful Dutch Company, against which, however, it made but little headway. Under the governorship of the Dutchman Caron, the first French factory was established at Surat, and successful negotiations were begun with Persia and Indo-China. His successor Francois Martin founded Pondichéry in 1676, and under his long and prudent administration, which lasted till 1727, the affairs of the company prospered. In 1687, however, the company lost its privilege of trade with China, and in 1719 it was united with the "Compagnie des Indes Occidentales" and the "Compagnie de la Chine," into the "Compagnie des Indes."

The united company was one of the schemes of Law, and its stocks shared the fate of his speculations. (See MISSISSIPPI BUBBLE.) In 1730 it was deprived of the trade with Africa; in 1731 of the trade with Louisiana; and in 1736 of the coffee trade with America. But the company prospered in India under the able governor Dumas (1735-41), who, by taking advantage of the quarrels among the natives, greatly extended its possessions and influence. Equally successful was his illustrious successor Dupleix (1741-54), ably supported in military matters by La Bourdonnais (q.v.). Notwithstanding his able conduct of affairs against the English, he was recalled in 1753, and unsupported by the home Government, the colony was unable to maintain itself against Clive. (See the account of the English Company given above.) The activity of the French Company was suspended by royal decree in 1769, and in the following year it turned over its capital, amounting to over 500,000,000 livres, to the King. In 1785 a new company, with commercial privileges only, was established, but it was definitely abolished by the Convention in 1784.

DANISH EAST INDIA COMPANY. After unsuccessful attempts in 1616 and 1634, a Danish company was established in 1729 by King Frederick IV. Unfettered by the trade restrictions under which the other companies labored, it became at the end of the eighteenth century one of the principal trading companies of Europe. Its prosperity declined with the advance of the English Empire in India, and it was ruined in the war between Great Britain and Denmark in 1801. Its possessions, of which Tranquebar and Serampur were the chief, were sold to Great Britain in 1845.

BIBLIOGRAPHY. For information concerning the ENGLISH COMPANY consult: *Charters Granted to the East India Company from 1601: Treaties and Grants from the Princes of India from 1756 to 1812* (London, n.d.); *The Law Relating to India and the East India Company* (London, 1841); Stevens, *Dawn of British Trade to the East Indies* (London, 1886), consisting of reprints of the minutes of the company's meetings during the early period. The standard work on the subject is J. Bruce, *Annals of the East India Company* (London, 1810); J. A. Mills, *History of British India*, ed. by H. H. Wilson (London, 1858), is also valuable. An excellent brief modern account from the economic standpoint is W. Cunningham, *Growth of English Industry and Trade in Modern Times* (Cambridge, 1892), 26-29, 125-32, 267-78, 532-70, 593-97. Dr. Macpherson, *Annals of Commerce* (London, 1805), is standard. Consult, also: W. T. Raynal, *A Philosophical and Political History of the Settlement and Trade in the East and West Indies* (London, 1777); and J. Macpherson, *The History and Management of the East India Company* (London, 1779); Beckles, *Ledge and Sword* (London, 1903).

For the foundation of the DUTCH COMPANY consult Van der Chijs, *De Stichting der Oost-Indische Compagnie* (Leyden, 1857); for its early laws, *Verzameling van instructies, ordonnanciën en reglementen voor de regeering van Nederlansch-Indië* (Batavia, 1848). General histories of the company and its career are those of Van Kampen (Haarlem, 1831-33); Meinsma (Delft, 1872-73); Lauts (Groningen, 1853-66); Terwogt (Hoorn, 1891); Deventer (The Hague, 1886-87); Jonge (ib., 1886-1895).

For information about the FRENCH COMPANY consult Castonnet des Fosses, *L'Inde française avant Dupleix* (Paris, 1887); Dufresne de Francheville, *Histoire de la Compagnie des Indes* (Paris, 1746).

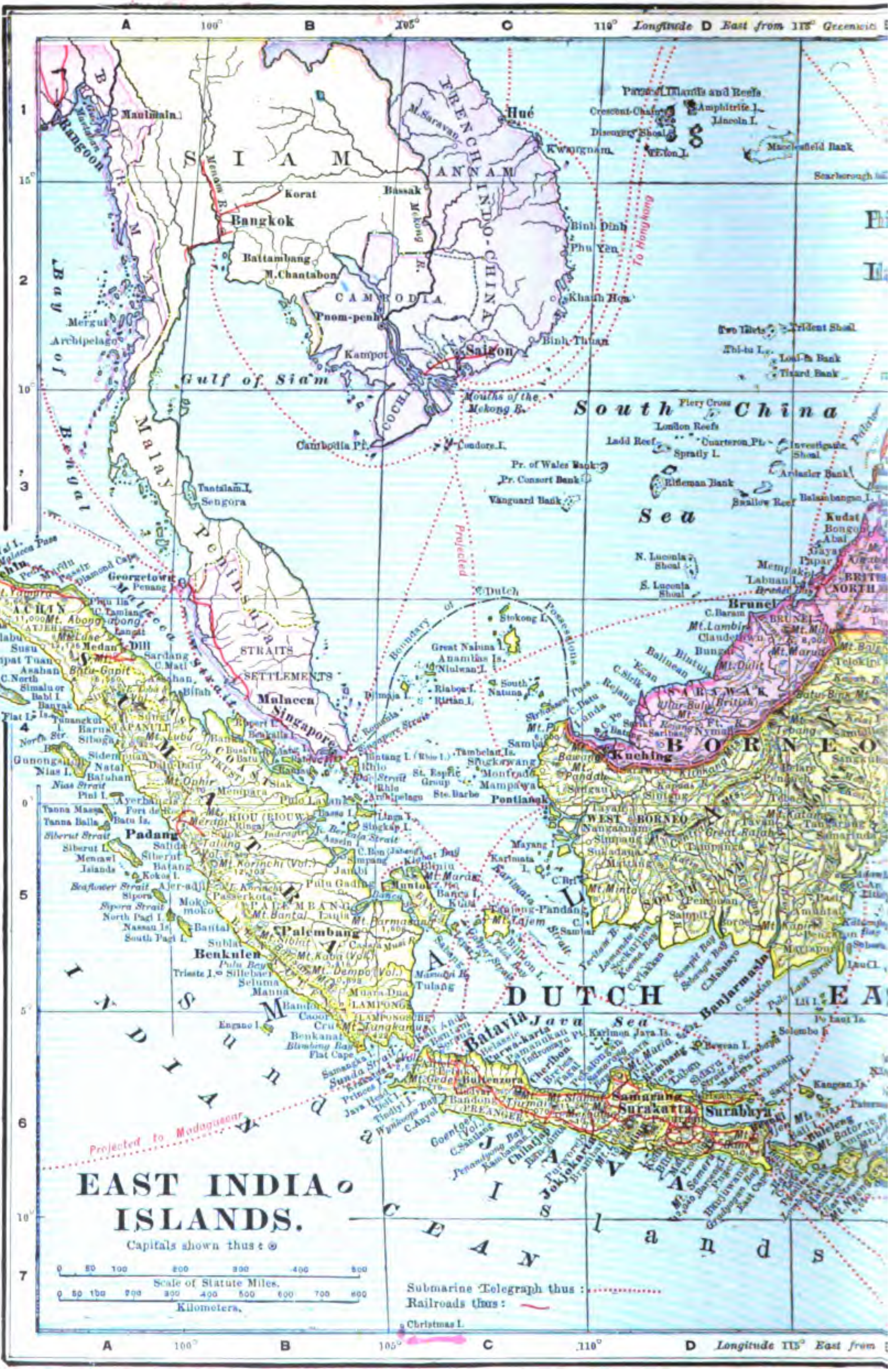
EAST INDIA HOUSE. The home of the East India Company, on Leadenhall Street, London, removed in 1862. Its noted museum was removed to Fife House, Whitehall, and in 1880 was placed under the management of the South Kensington Museum. Charles Lamb, James Mill, and John Stuart Mill held clerkships in the East India House.

EAST IN'DIES. A term vaguely applied to the southeastern part of Asia, embracing India in the broader sense and the Malay Peninsula, and the islands in the Malay Archipelago, together with the Philippines. (See accompanying map.) The name 'Indies' originated in the fifteenth century, and its meaning was afterwards extended to include the newly discovered lands in the New World. Later a distinction was made between the West and East Indies. See DUTCH EAST INDIES.

EASTINGS. See SAILINGS.

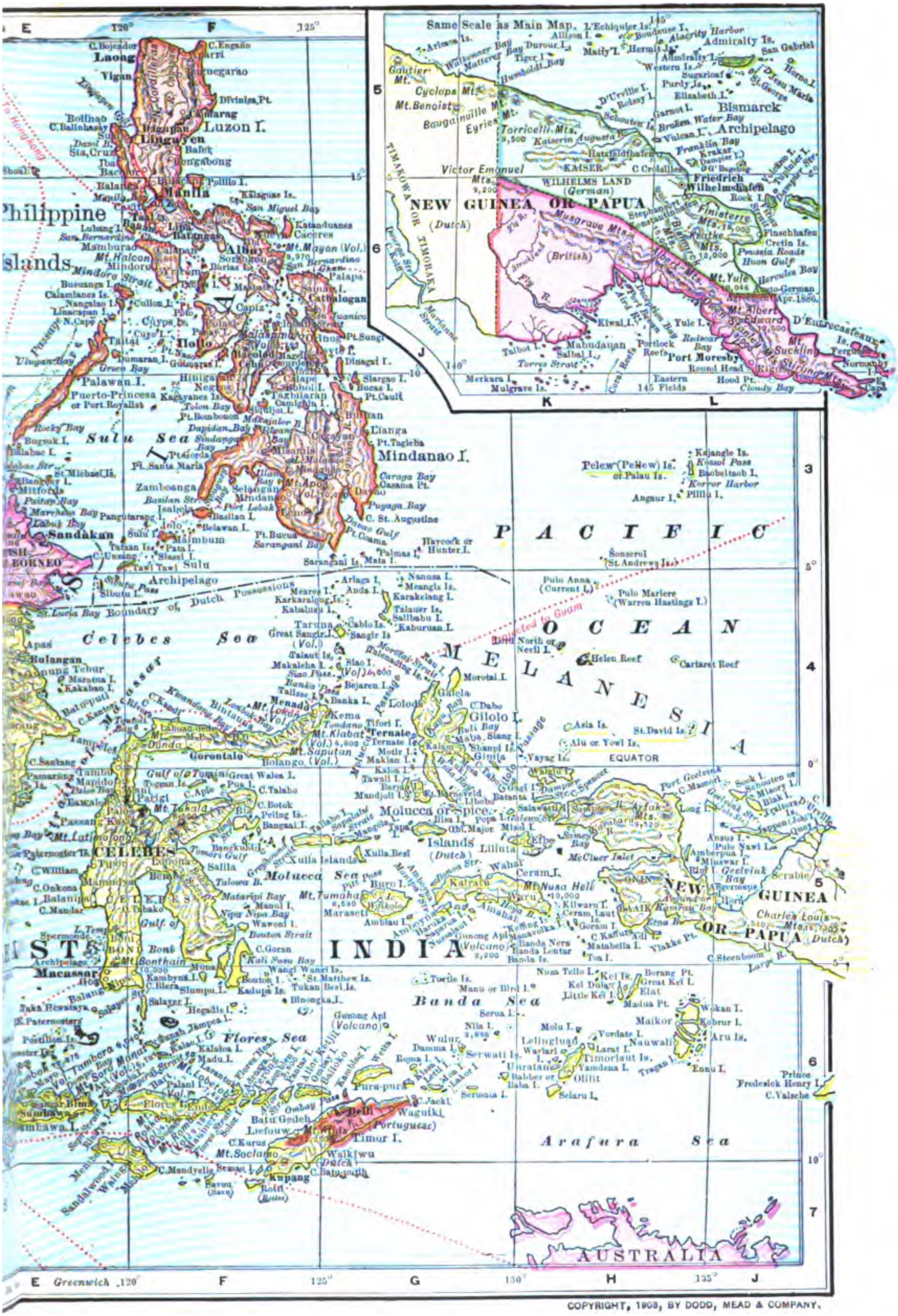
EAST LAKE. A town in Jefferson County, Ala., about six miles northeast of Birmingham (Map: Alabama, C 2). Howard College (Baptist), and the Alabama Boys' Industrial School are here. Pop., 1905 (local census), 3500.

EAST'LAKE, Sir CHARLES LOCK (1793-1865). An English historical painter, born at Plymouth, November 17, 1793, the youngest son of George Eastlake, solicitor to the Admiralty and judge-advocate of Plymouth. He studied in the schools of the Royal Academy in 1809, and also under Haydon. As early as 1810 the lad's designs attracted attention, and a commission was given him by Jeremiah Haimon, the subject being "The Raising of Jairus's Daughter." In 1815 Eastlake was in Paris, studying and copying pictures from the Louvre, but he left on March 19, 1815, and was at Plymouth when Napoleon arrived there on board the *Bellerophon*. In 1817 he went to Italy, and in 1819 to Greece. Afterwards he returned to Rome, and there spent fourteen years. He devoted himself chiefly to landscape painting and landscape with figures of Italian peasantry. He lived principally in Rome until he was elected an Academician in 1830, when he settled in London. In 1823 he sent to the Royal Academy three views of Rome, one of which, "The Spartan Isidas," now in possession of the Duke of Devonshire, was especially noticed. In 1841 Eastlake was appointed secretary to the Royal Commission for decorating the Houses of Parliament, and in 1842 Librarian to the Royal Academy; in 1843 Keeper of the National Gallery. In 1850 he was knighted and elected president of the Royal Academy. From that time until his death he was chiefly engaged in selecting pictures to be bought by the Government for the National Gallery. He died in Pisa, December 23, 1865.



EAST INDIA ISLANDS.

Capitals shown thus ⊙



COPYRIGHT, 1903, BY DODD, MEAD & COMPANY.

Eastlake translated and edited several books on painting, among them Goethe's *Theory of Colors* (1840) and Kugler's *Schools of Painting in Italy* (1842). He also wrote many articles for periodicals, and some books, notably *Materials for the History of Oil Painting* (1847), and *Contributions to the Literature of the Fine Arts* (1848; 2d series, 1870). As a painter, however, he is less important, being a representative of the academic eclecticism. Among his principal paintings are "Lord Byron's Dream" (1827), in the National Gallery, London; "Una Delivering the Red Cross Knight" (1830); "Gaston de Foix Before the Battle of Ravenna" (1838); and "Christ Blessing Little Children" (1840). For his life, consult the *Memoir* by Lady Eastlake (London, 1870).

EASTLAKE, Lady ELIZABETH (RIGBY) (1809-93). An English author, born at Norwich, England. She lived for some time in Germany and at Reval, in Russia, and in 1841 her first book, an account of her residence at the latter place, entitled *A Residence on the Shores of the Baltic*, was published in London. In 1842 an introduction to Lockhart led to her becoming a regular staff contributor to the *Quarterly Review*, a connection which continued for many years. She married Sir Charles Lock Eastlake, the artist, in 1848, and traveled with him extensively in Italy. Through his influence she turned her attention to the history and criticism of art. She published *The Jewess*, a novel (1843); *Livonian Tales* (1844); *Music and the Art of Dress* (1852); *Life of John Gibson, R.A., Sculptor* (1870); *Life of Mrs. Grote* (1880); *Five Great Painters* (2 vols., 1883). She translated Waagen's *Treasures of Art in Great Britain* (4 vols., 1854); and Brandl's *Samuel Taylor Coleridge and the English Romantic School* (1886); and edited her husband's works (1870), and his edition of Kugler's *Handbook of Painting: Italian Schools* (1874).

EAST LIVERPOOL. A city in Columbiana County, Ohio, 44 miles west by north of Pittsburg, Pa., on the Pennsylvania Company Railway and on the Ohio River (Map: Ohio, J 4). Its area is four and one-half square miles. It has a Carnegie (public) library, and three parks. Two bridges connect the city with Chester and Newell, W. Va. It is the most important centre in the United States for the manufacture of porcelain, including porcelain ware and porcelain electrical supplies. There are also machine-shops, a large sewer-pipe factory, and brick-works. The city has a supply of natural gas. The government, under the Ohio code of 1902, is vested in a mayor, and a board of public service, biennially elected, and a council. The board of public safety is appointed by the executive and council. The water-works are the property of the municipality. East Liverpool was settled as early as 1795, and was incorporated in 1834. Population, 1900, 16,485; 1906 (local est.), 22,000.

EAST LONDON. A seaport town of Cape Colony, situated at the mouth of the Buffalo River, on the eastern coast of the colony (Map: Cape Colony, L 8). It has a number of banks, a library, and several consular representatives. There is a spacious landing at the mouth of the river, accessible even for heavy vessels. The town is one of the most important ports of Cape Colony, having an annual trade of about $20,000,000. The chief article of export is wool. Population, in 1891, 12,000.

EAST LOTHIAN, lō′THI-an. See HADDINGTONSHIRE.

EAST MAIN. A former portion of the Hudson Bay Territories, now incorporated as the Ungava District (q.v.), in the Dominion of Canada (Map: Canada, G 5). The East Main or Slade River crosses its southern section, entering Hudson Bay, here known as James Bay, about latitude 52° 15′ N., after a course of 400 miles.

EASTMAN, CHARLES GAMAGE (1816-61). An American editor and poet. He was born at Fryeburg, Oxford County, Me., and graduated at the University of Vermont in 1837. He founded the *Spirit of the Age*, published at Woodstock (1840), and in 1846 he became the proprietor of the Montpelier *Patriot*, which he edited for nearly fifteen years. In 1848 he published a volume of his poems, in which his delineations of the rural life of New England secured for him the title of the "Burns of the Green Mountains." His better-known verses include: "Come, Sing Me the Song that You Sang Years Ago," "The Pauper's Burial," and "The Farmer Sat in His Easy Chair."

EASTMAN, HARVEY GRIDLEY (1832-78). An American educator, born in Marshall, N. Y. He was the founder in 1859 of the Eastman National Business School at Poughkeepsie, N. Y.

EASTMAN, MARY HENDERSON (1817—). An American author, born in Warrenton, Va. While her husband, Capt. Seth Eastman, was stationed on the frontier, she made a careful study of Indian life, and wrote an interesting work, entitled *Dahcotah, or Life and Legends of the Sioux* (1849); and a *Romance of Indian Life* (1852). In 1852 she published *Aunt Phillis's Cabin*, a reply to Mrs. Stowe's *Uncle Tom's Cabin*. She has also published the *American Aboriginal Portfolio* (1853), and *Chicora and Other Regions of the Conquerors and the Conquered* (1854).

EASTMAN, SETH (1808-75). An American soldier. He was born at Brunswick, Me., and graduated at the United States Military Academy, and assigned as lieutenant in the First Infantry in 1829. After serving on frontier duty at forts Crawford (1829) and Snelling (1830), and on topographical duty from 1831 to 1833, he was appointed assistant instructor in drawing at West Point (1833-40). From 1850 to 1857, he was engaged in the Bureau of Indian Affairs as illustrator of the national publication entitled *History, Condition, and Future Prospects of the Indian Tribes of the United States*. He was promoted through successive grades to be a lieutenant-colonel of infantry, was retired in 1863, and brevetted brigadier-general in 1866. He wrote a *Treatise on Topographical Drawing* (1837).

EAST MAUCH CHUNK. A borough in Carbon County, Pa., 53 miles south by east of Wilkesbarre, on the Lehigh Valley Railroad, and on the east bank of the Lehigh River (Map: Pennsylvania, F 3). It is in the anthracite coal-mining region. It has silk-mills. Population, 1900, 3458.

EASTON, ēs′ton. A town and the county-seat of Talbot County, Md., 59 miles southeast of Baltimore, on the Baltimore, Chesapeake, Atlantic, and the Philadelphia, Baltimore and Washington railroads (Map: Maryland, N 6). It is the seat of a bishop of the Protestant Episcopal Church. The industrial establishments include foundries and machine-shops, flour and lumber mills, canning factories, carriage and wagon works, a furniture-factory, shirt-factory, and others. Population, in 1890, 2939; in 1900, 3074.

EASTON. A town, including several villages, in Bristol County, Mass., 24 miles south of Boston, on the New York, New Haven and Hartford Railroad (Map: Massachusetts, E 3). It has a public library and some fine public buildings, gifts of the Ames family. There are extensive manufactures of shovels, foundry and machine-shop products, hardware specialties, wire goods, automobiles, etc. Pop., 1900, 4837; 1905, 4909.

EASTON. A city and county-seat of Northampton County, Pa., at the junction of the Delaware and Lehigh rivers, 50 miles (direct) north of Philadelphia, and 65 miles (direct) from New York (Map: Pennsylvania, F 3). It is on the Pennsylvania, the Lehigh Valley, the Central of New Jersey, the Lackawanna, and other railroads, and is connected by canals with New York, Philadelphia, and the coal regions. The city is near the great cement belt, and near slate-quarries and coal and iron fields. It has manufactures of drills, compressors, railway supplies, organs, crayons, carved and turned wood, silk, hosiery, braces, etc. The government of Easton is administered by a mayor, elected every three years, and a bicameral city council, which elects the city engineer, and confirms the executive's appointments to the Board of Health and Fire Department. The city treasurer and controller are chosen by popular election. Easton owns and operates its electric-light plant. Population, in 1890, 14,481; in 1900, 25,238; in 1903 (est.), 26,775.

Easton was laid out in 1750, was incorporated as a borough in 1789, and was chartered as a city in 1887. Here in 1756, 1757, 1758, and 1761 important treaties were made with the Indians, and in 1779 General Sullivan's expedition against the Iroquois was here organized. Lafayette College (q.v.) was founded at Easton in 1832. Consult Condit, *The History of Easton* (Easton, 1889).

EASTON, Morton William (1841—). An American philologist. He was born at Hartford, Conn., and, after attending Yale and Columbia, took a supplementary course at the University of Vienna. After occupying the chair of comparative philology at the University of Tennessee for several years, he was appointed to a similar post in the University of Pennsylvania. His writings include contributions to the *Journal of the American Oriental Society,* on phonetics, Sanskrit, Iranian, and kindred subjects; to the *Journal of the American Oriental Society, the Transactions of the American Philological Association,* the *American Journal of Philology,* and similar publications.

EASTON, Nicholas (1593-1675). A Colonial Governor of Rhode Island. He emigrated from Wales to Massachusetts in 1634, was the first settler in Agawam (now Newberry), Mass., in 1635, and in 1638 built the first English house in Hampton, N. H. In 1639 he went to the site of the present Newport, R. I., where, also, he built the first house. He was elected President of Providence Plantations in 1649 and again in 1654, served for four years as Deputy Governor, and from 1672 until his death held the position of Governor under the second charter. His son John was Governor from 1690 to 1695, and was the author of a *Narrative of the Causes which Led to King Philip's War,* which was published at Albany in 1858 under the editorship of Franklin B. Hough.

EAST ORANGE. A city in Essex County, N. J., adjoining Newark; on the Erie and the Lackawanna railroads (Map: New Jersey, D 2). It is primarily a residential town, containing the handsome suburban homes of many New York and Newark business men. East Orange has well-paved and shaded streets, and maintains a public library. Its industrial plants include electrical works and a factory for the manufacture of pharmaceutical supplies. The government is administered by a mayor, elected biennially, and a city council. With the exception of the board of education and board of assessors, chosen by popular vote, all municipal officials are nominated by the executive with the consent of the council. East Orange was part of Orange until 1863, when it was incorporated as a separate township. In 1899 it was chartered as a city. Population, 1900, 21,506; 1905, 25,175. Consult Whittemore, *The Founders and the Builders of the Oranges* (Newark, 1896).

EASTPORT. A city and port of entry in Washington County, Me., on Moose Island, in Passamaquoddy Bay, and on the Washington County Railway; it is the easternmost city in the United States (Map: Maine, J 6). It possesses a deep harbor and has steamboat communication with important points on the coast. Eastport is the centre of large fishing and sardine-canning interests. It has a custom house and a public library. The government is administered under a charter of 1893, by a mayor, elected annually, and a city council and board of aldermen. Population, in 1890, 4908; in 1900, 5311. Eastport was permanently settled about 1782. Its trade was severely crippled by the Embargo Act, and the town was for several years, especially during 1807-18, notorious as a smuggling centre. Great Britain had long claimed all the islands in Passamaquoddy Bay, and on July 11, 1814, an English force captured Eastport and held it under strict martial law until June 30, 1818. Consult Kilby, *Eastport and Passamaquoddy, A Collection of Historical and Biographical Sketches* (Eastport, 1888).

EAST PROVIDENCE. A town in Providence County, R. I., separated from the city of Providence by the Seekonk River; on the New York, New Haven and Hartford Railroad (Map: Rhode Island, C 2). It has chemical, electrical, and wire works, a handkerchief factory, bleachery, and other industrial establishments. The government is in the hands of a town council, which elects a majority of administrative officials, others being chosen by popular vote. Town meetings are held annually. Together with the town of Seekonk, Mass., East Providence was once a part of the old town of Rehoboth. It was set off from Seekonk when the Massachusetts-Rhode Island boundary line was fixed. It was incorporated in 1862. Population, in 1890, 8422; in 1900, 12,138; in 1905, 13,750.

EAST RETFORD, rĕt′fērd. A municipal borough and market-town in the county of Nottingham, England, on the Idle, an affluent of the Trent, 138 miles north-northwest of London (Map: England, F 3). The town has a handsome town hall, corn exchange, and market hall. It owns its gas and water supply and maintains public baths, markets, and slaughter-houses. There are iron-foundries and manufactures of paper and india-rubber; and a considerable trade in hops is carried on. Population, in 1891, 10,600; in 1901, 12,300. Retford appears in Domesday, and received its first charter from Edward I.

EAST RIVER. The strait connecting Long Island Sound and upper New York Bay (Map: Greater New York, E 8). It is also connected on the north through the Harlem River and Spuyten Duyvil Creek with the Hudson. It separates the boroughs of Manhattan and the Bronx on the west and north from those of Brooklyn and Queens on the east and south. It is about fifteen miles long, and varies from less than one-half a mile to three and a half miles in width. Its principal islands are Blackwell's, Ward's, Randall's, Riker's, and North Brother, containing city institutions. A channel between Ward's Island and Long Island, in what is known as Hell Gate, has been made navigable by blasting. The famous Brooklyn Bridge, and the Williamsburg Bridge completed in 1905, span the East River, and two more gigantic bridges are in course of construction.

EAST SAINT LOUIS. A city in Saint Clair County, Ill., on the Mississippi River, connected by the Ead's bridge with St. Louis, Mo., and entered by numerous lines of railroad (Map: Illinois, B 5). East Saint Louis is an important manufacturing centre, its industrial interests being promoted by valuable coal deposits in the vicinity. It has malleable iron, glass, frog and switch, aluminum, white lead, paint, car-truck, car-springs, forging, locomotive, pneumatic tool and silica works, a rolling-mill, foundries, a fertilizer plant, grain elevators, baking-powder factories and flouring-mills. There are also stock-yards, a large horse and mule market, and pork and dressed beef packing industries. Its City Hall, high school, and the public library are modern and cost $300,000. East Saint Louis was incorporated as a town in 1861, and was chartered as a city in 1865. It is a progressive municipality, having expended in the decade preceding 1906 over $4,000,000 in street and other public improvements. The government is administered by a mayor, elected biennially, and a city council, of which the executive is a member. The city treasurer, city attorney, assessor, city clerk, and justices of the peace are elected by the people. East Saint Louis has had rapid growth, its population having increased from 5644 in 1870, to 29,655 in 1900 and to 56,000 (local census) in 1906.

EAST STONE′HOUSE. A town in Devonshire, England, forming with Plymouth (q.v.) and Devonport (q.v.), the aggregation styled 'The Three Towns.' Population, in 1891, 15,400; in 1901, 15,100.

EASTWARD HO! A comedy by Marston, Chapman, and Jonson. It was written and produced in the winter of 1604-05, and contains a satire on the Scotch, for which the authors were imprisoned and even threatened with mutilation.

EAST′WICK, Edward Backhouse (1814-83). An English diplomatist and Orientalist. He was educated at Merton College, Oxford. In 1845 he was appointed professor of Hindustani at the East India Company's College of Haileybury, and in 1859 assistant political secretary in the India Office. From 1860 to 1863 he was secretary of legation at the Court of Persia, in 1864 and 1867 was a commissioner for the negotiation of a Venezuelan loan, and in 1866 was appointed private secretary to Lord Cranborne, the Secretary of State for India. In 1868-74 he represented Falmouth and Penryn as a Conservative in the House of Commons. His publications include translations of (1852) the *Gulistān* of Shekh Muslihu'd-dīn Sādī, and (1854) the *Anvār-i Suhaili*, with a *Concise Grammar of Hindustani* (1847 and 1858); a *Handbook for India* (1859 "Murray's Handbooks" series), *Journal of a Diplomat's Three Years' Residence in Persia* (2 vols., 1864); and *Venezuela: or, Sketches of Life in a South American Republic* (1864; first published in Dickens's *All the Year Round*).

EASY, Sir Charles. The title-character in Cibber's *Careless Husband*. His tendency toward indolent vice is checked and cured by the sense and tact of an amiable wife.

EASY, Midshipman. See Midshipman Easy.

EATON, ē′ton. A village and the county-seat of Preble County, Ohio, 58 miles north by northwest of Cincinnati, on the Pittsburg, Cincinnati, Chicago and Saint Louis Railroad (Map: Ohio, A 6). It is the centre of a fertile agricultural region. Population, in 1890, 2934; in 1900, 3155.

EATON, Amos (1776-1842). An American scientist, born in Chatham, N. Y. Graduating from Williams College in 1799, he was admitted to the bar and began the practice of law and civil engineering at Catskill, N. Y. He gave much time to study of the natural sciences, including chemistry, mineralogy, and geology, and in 1820 he was engaged to make a geological and agricultural survey of Albany and Rensselaer counties, one of the first of such undertakings in this country. He afterwards made a geological survey of the region along the Erie Canal, from which was constructed a profile section of the rock formations from the Atlantic Ocean across Massachusetts and New York to Lake Erie. His best-known works are: *An Index to the Geology of the Northern States* (1818); *A Manual of Botany of North America* (1833); and *Geological Note Book* (1841).

EATON, Amos Beebe (1806-77). An American soldier. He was born at Catskill, N. Y.; graduated at West Point and was assigned as lieutenant of Fourth Infantry in 1826. After having served on the northern frontier, he was transferred, in 1838, to the Department of Subsistence, and served as commissary in Florida, on the Canada border, and in New York. In the Mexican War he was chief commissary of subsistence under Gen. Zachary Taylor, receiving the brevet of major in 1847. During the Civil War he was purchasing commissary at New York City for the armies in the field, and in 1864 was appointed commissary-general of subsistence at Washington. He rose to the regular rank of brigadier-general, and in 1865 was brevetted major-general. He was retired from active service in 1874.

EATON, CHARLES WARREN (1857—). An American landscape painter. He was born in Albany, N. Y. His work, both in oil and watercolor, has often a poetic charm, and is truthful in drawing and color. In 1900 he received honorable mention at the Paris Exposition.

EATON, DANIEL CADY (1834-95). An American botanist. He was born at Fort Gratiot, Mich.; studied at Yale and Harvard, and was professor of botany at Yale from 1864 until his death. He contributed to *Gray's Manual,* and to Chapman's *Flora of the Southern States,* the parts relating to ferns, and published *The Ferns of North America* (1878-79).

EATON, DORMAN BRIDGMAN (1823-99). An American lawyer and civil service reformer. He was born in Hardwick, Vt.; was educated at the University of Vermont and the Harvard Law School, and began the practice of law in New York in 1850. In 1866 he drafted the law establishing the Board of Health for New York City, and also that creating the municipal police courts. Upon the establishment of the first Civil Service Commission in 1873 he was appointed one of the commissioners by President Grant. He drafted the National Civil Service Act (the Pendleton Act) which became a law in 1883, and was appointed by President Arthur a member of the new commission. He resigned in 1885, but was reappointed by President Cleveland and served until 1886. He published *Civil Government in Great Britain* (1880); *The Independent Movement in New York* (1880); *The Term and Tenure of Office* (1882); *The Problem of Police Legislation* (1895); and *The Government of Municipalities* (1899).

EATON, JOHN (1829-1906). An American educator and Civil War veteran, born at Thetford, Vt. He graduated at Dartmouth College in 1854, studied at Andover Theological Seminary, and was ordained in 1862 to the Presbyterian ministry. In 1862 General Grant made him superintendent of contrabands and soon after he became general superintendent of refugees for Mississippi, Arkansas, western Tennessee and northern Louisiana. In 1863 he was made colonel of the Sixty-third regiment of colored infantry, and in 1865 he was advanced to brevet brigadier-general. He reorganized the Bureau of Refugees, Freedmen, and Abandoned Lands, after which he edited the Memphis (Tennessee) *Post* in 1866-67, and in 1867-69 was State superintendent of public instruction in Tennessee. He was appointed United States Commissioner of Education in 1870, and served with great efficiency. In 1886-91 he was president of Marietta College. In 1895 he was appointed president of Sheldon Jackson College, at Salt Lake City, and in 1898 he became inspector of education in Porto Rico.

EATON, JOHN HENRY (1790-1856). An American legislator. He was born in Tennessee, and after studying law devoted himself to practice at the bar in Nashville. He was Secretary of War from 1829 to 1831, in which year he was appointed Governor of Florida. In 1836 he became Minister to Spain. He wrote the *Life of Andrew Jackson* (1824).

EATON, MARGARET (O'NEILL), best known as PEGGY O'NEILL (c.1796-1879). The wife of J. H. Eaton (q.v.), Secretary of War under President Jackson. She was the daughter of a Washington tavern-keeper. About 1823 she married a man named Timberlake, a purser in the United States Navy, who in 1828 committed suicide while on duty in the Mediterranean. In January, 1829, she was married to Major J. H. Eaton (q.v.), who soon afterwards entered President Jackson's Cabinet as Secretary of War. Various charges were brought against her in connection with her alleged conduct toward Major Eaton himself while she was still Mrs. Timberlake. On this account the wives of other Cabinet members and Washington society generally refused to recognize her. Jackson, an old friend of both Mr. and Mrs. Eaton, endeavored to break down the opposition against her, and even seems to have threatened to remove several of the Secretaries should their wives remain obdurate; but his efforts met with little success, and partly for this reason Jackson effected an almost complete reorganization of his Cabinet. Politically the incident was chiefly significant from the fact that it helped to strengthen the friendship between Jackson and Van Buren, who had ostentatiously befriended Mrs. Eaton, and to alienate Jackson and Calhoun, then Vice-President, whose wife had persistently refused to recognize Mrs. Eaton socially, and thus to assure the nomination of the former in preference to the latter for the Presidency by the Democratic Party in 1836. In later years Mrs. Eaton is said to have been exceedingly popular in the society of Madrid while her husband was Minister of the United States to Spain. Some time after the death of her husband (1856) she married a young Italian dancing master, Antonio Buchignani, then only about twenty years old, from whom she eventually secured a divorce. Consult: Parton, *Life of Andrew Jackson,* vol. iii. (New York, 1860); and an article, "Margaret O'Neill Eaton," in the *International Review,* vol. viii. (New York, 1880).

EATON, THEOPHILUS (c.1591-1658). An English merchant, one of the founders and the first Governor of the Colony of New Haven. He was born in Stony Stratford, Buckinghamshire, England, the son of a minister; became a prosperous merchant; was chosen deputy-governor of the East Land Company, and lived for several years in Denmark as an agent of Charles I. After his return he settled in London, where he was a member of the Puritan congregation of the Rev. John Davenport (q.v.), and in 1637 accompanied his pastor to Massachusetts, of whose charter he had been one of the original patentees. Late in the same year he selected a site for a new settlement, and early in 1638 he and Davenport with a small number of followers founded the town and Colony of New Haven (q.v.). In October, 1639, a government was regularly organized, and Eaton was chosen chief magistrate, to which position he was annually reëlected until his death. He was one of the organizers of the New England Confederation in 1643; and drew up (1655), with the aid of Davenport, the code of laws which have become known as the New Haven Blue Laws. Consult: Moore, "Memoir of Theophilus Eaton," in *Collections of the New York Historical Society,* 2d series, vol. ii. (New

York, 1849); and a sketch in Mather's *Magnalia*, vol. i. (London, 1702).

EATON, William (1764-1811). An American adventurer, prominent in the war between the United States and Tripoli. He was born in Woodstock, Conn.; ran away from home at sixteen; joined the army and served until 1783; and graduated at Dartmouth in 1790. In 1792 he rejoined the army as a captain, and served successively against the Shawnees in Ohio and the Seminoles in Georgia until 1798, when he was appointed American consul in Tunis. On the outbreak of the Tripolitan War in 1801 he arranged with Hamet, the rightful Pasha of Tripoli, for a combined land and naval attack upon Tripoli; but he was unable to secure the coöperation of the American naval officers. He then returned to the United States, in 1803, and in April, 1804, was appointed Naval Agent of the United States for the Barbary Powers. Late in the same year he returned to northern Africa and raised a force of five hundred men, with which in March, 1805, he set out across the Libyan Desert for Derne, the second city in importance in the Tripolitan Regency. This place was captured by storm on April 27, and was held against three subsequent attacks on the part of the Arabs. Soon afterwards, however, Tobias Lear, the United States Consul-General at Algiers, and Commodore Rodgers, commander of the United States fleet before Tripoli, concluded with the usurping Pasha, Yussuf, a treaty which provided, among other things, for the immediate evacuation of Derne, and Eaton was thus forced to give up his cherished scheme of restoring Hamet and obtaining more favorable terms for the United States Government. He accordingly returned to America in the fall of 1805. Consult: *The Life of the Late General William Eaton* (Brookfield, Mass., 1813); Felton, "Life of William Eaton," in Sparks, *Library of American Biography*, vol. ix. Boston, 1838); and the brief sketch in Adams's *History of the United States from 1801 to 1817*, vol. ii. (New York, 1889-91).

EATON, Wyatt (1841-96). An American figure and portrait painter, born at Phillipsburg, Canada. He was a pupil of the National Academy of Design, and afterwards studied under Gérôme at the Ecole des Beaux-Arts, Paris. He was the first secretary and one of the founders of the Society of American Artists and for some years its president. Among his subject pictures are "Harvesters at Rest" and "Reverie," which attracted attention at the Paris Exposition of 1878. But his most notable work is in portraiture. The series of American poets, engraved by Timothy Cole for the *Century Magazine*, established his reputation in this country. Since then the portraits of Cole himself as the "Man with the Violin," and Mrs. R. W. Gilder, exhibited at the Paris Exposition of 1889, have made his reputation international. Eaton's subdued color scheme and strong, simple handling suggest the work of Millet.

EATON HALL. One of the famous show-places of England, the residence of the Duke of Westminster, the richest peer in England. It is situated on the river Dee, 3½ miles from Chester, whence a small steamer leaves daily for Eaton Hall. The hall, which is the fourth on the site, is purely modern, erected in 1870-82 by the architect Waterhouse. It is a fine specimen of neo-Gothic architecture. A well-timbered park, stocked with herds of deer, surrounds it, and gardens and terraces of much beauty are open to the visitor, as is also the stud-farm. This park is extensive, the mansion being nearly three miles from the lodge gates. Some fine paintings are exhibited in the various apartments, among them specimens of Rubens, Benjamin West, and Millais.

EA'TONTON. A city and the county-seat of Putnam County, Ga., 59 miles by rail north by northeast of Macon, on the Central of Georgia Railroad (Map: Georgia, C 2). It is in an agricultural, fruit and cotton growing, and dairying country, and has a flourishing trade in peaches and plums. Its industries include several cotton-factories. Pop., in 1890, 1682; in 1900, 1823.

EAU CÉLESTE, ō sâ'lĕst′. See Fungicide.

EAU CLAIRE, ō klâr. A city and county-seat of Eau Claire County, Wis., 94 miles east of Saint Paul, Minn., at the junction of the Eau Claire and Chippewa rivers, on the Wisconsin Central, the Chicago, Milwaukee and Saint Paul, and the Northwest Line (Map: Wisconsin, B 4). It is the leading commercial centre of this part of the State, is at the head of navigation on the Chippewa, and has good water-power in both rivers. Eau Claire is the outlet of the Chippewa lumber district, and its manufactures of lumber are extensive. There are also foundries, a paper-mill, linen-mill, and manufactures of furniture, refrigerators, sashes and doors, and shoes. The city has a Carnegie public library, three public parks, fine school buildings (the high school having been erected at a cost of $100,000), and the Sacred Heart (Roman Catholic) and the Norwegian Lutheran hospitals. Population, 1900, 17,517; 1905, 18,737.

EAU CRÉOLE, ō krâ'ôl′. A very fine liqueur, made in Martinique, by distilling the flowers of the mammee apple (*Mammea Americana*) with spirit of wine.

EAU DE COLOGNE, d*e* kô-lōn′ (Fr., Cologne water). A perfume invented in northern Italy by one of the Farina family, who subsequently settled in Cologne. It is now made by a number of persons bearing the original patronymic, who are residents of Cologne, as well as by perfume-makers all over the world. It consists essentially of pure distilled alcohol with various aromatic oils so blended as to yield a refreshing and grateful odor. Various formulas have been given for the original perfume, and among these is the following, originally published in the journal of the North German Apothecaries' Association: Dissolve 2 ounces of purified benzoin, 4 ounces of oil of lavender, and 2 ounces of oil of rosemary in 9 gallons of 95 per cent. alcohol; to this solution add successively of the oils of neroli, neroli petit-grain, and lemon, each 10⅖ ounces, and of the oils of sweet orange peel, limes, and bergamot, each 20⅘ ounces, together with tincture of rose-geranium flowers, sufficient to suit the taste; macerate for several weeks and then bottle. An excellent imitation is made by taking 6 gallons of 95 per cent. alcohol, oil of orange, and oil of citron each 5 ounces, oil of neroli 4 ounces, oil of rosemary and oil of bergamot each 2 ounces, mix by stirring, and allow to stand until the solution is complete. It is claimed that the best foreign eaux de Cologne are obtained by distillation, the purpose of which is to secure a perfect blending of the perfumes, but in this country the same result is generally accomplished by allowing the mixture to stand until the desired effect is obtained.

EAU DE JAVELLE, zhȧ′vĕl′ (Fr., Javelle water, from *Javelle*, near Paris), or Javelle Water. A solution of hypochlorite of potash, which is used to remove stains from linen or muslin and from white marble. Practically it is adulterated with bicarbonate of potash. It is poisonous.

EAUX-BONNES, ȯ′bŭn′. A watering-place in the Department of Basses-Pyrénées, France, 20 miles south-southeast of Oloron (Map: France, F 9). It is picturesquely situated in a narrow gorge surrounded with rocks at the junction of two mountain streams. There are seven hot sulphur springs, used mainly for drinking, and considered of special efficacy for throat diseases and consumption. The place contains a number of fine hotels, and is visited annually by about six thousand guests. Permanent population, in 1901, 768. A short distance from Eaux-Bonnes is situated a smaller watering-place, Eaux-Chaudes, with sulphur springs, used mainly for bathing.

EAUX-CHAUDES, shȯd′. See Eaux-Bonnes.

EAVESDROPPING, or Eavesdrip. In the law of real property, the right to permit rain-water falling upon one's roof to drop from the eaves upon the adjoining land of another. This is not a natural right inhering in lands, like the right of lateral support, but is in the nature of an easement, which may, like the easement of ancient lights, be acquired by prescription, or immemorial user, or by grant. It is a form of the easement of drainage. The right is not lost by changes in the roof or in the height of the house to which it attaches, so long as the drip from the eaves is not thereby substantially increased or varied. It was recognized at the Roman law as the urban servitude of *stillicidium*. See Drainage; Easement; Servitude.

The term *eavesdropping* is also employed in a derivative sense in the criminal law of England and the United States to describe a form of nuisance, punishable as a misdemeanor (q.v.). It consists in secretly loitering about a building with intent to overhear discourse therein, and to repeat and publish it to the annoyance, vexation, or injury of others. See the authorities referred to under Criminal Law, and the statutes of the various States.

EAVES-SWALLOW, Cliff-Swallow, or Republican Swallow. See Barn-Swallow.

EBAL, ē′băl, and **GERIZIM,** gĕr′ĭ-zĭm. Two mountains of Palestine significant in Hebrew tradition in connection with the blessing and cursing of the people (Deut. xi. 29, xxvii. 11-26; Joshua, viii. 33-4). They are situated in central Samaria, separated by a narrow valley about 200 yards wide, in which stands the town of Nabulus (Neapolis, the ancient Shechem), which is still the metropolis of the Samaritans. They rise to an elevation of 3077 feet and 2849 feet respectively, and are known at the present day as Jebel Sulemiyeh and Jebel et-Tur. The Samaritans erected a temple on Mount Gerizim probably in the fourth century before Christ. It was destroyed by Hyrcanus about two hundred years later, but the mountain continued to be held sacred. A rivalry between the Jerusalem and the Samaritan cults is a feature of post-exilic Jewish history and continues to the days of Jesus. The narrative of the blessing and cursing in Deuteronomy is thought by many to be a late addition to the book reflecting the Jewish side of this controversy. The Hebrew text of Deut. xxvii. 4-8 enjoins the building of an altar to Jehovah on Mount Ebal, and the placing there of large stones inscribed with the law. This injunction according to the Samaritan text refers to Gerizim. Two explanations of the discrepancy are possible. Either the Hebrew is correct and the Samaritan an intentional alteration to justify the building of the temple on Gerizim, or the Samaritan is correct and the Hebrew an early change to deprive this temple of its scriptural support. The former view is generally held by modern scholars, but there is much to be said in favor of the latter. If the law which the Samaritans recognized ordained the construction of a sanctuary on Mount Ebal, it is difficult to see why they should deliberately have chosen the other mountain; while it is quite apparent why the mention of Gerizim as a spot divinely selected for a sanctuary in a book that never refers to Jerusalem by name should have caused a Jewish scribe to correct it as an error. In either case the injunction is singularly out of harmony with the centralizing tendency of the code, and seems to point to a firmly rooted tradition. It was to Gerizim and the controversy between Jews and Samaritans concerning its sanctity that the 'woman of Samaria' referred in her conversation with Jesus (John iv. 20-1). The Samaritans claim that Gerizim was the scene of the attempted sacrifice of Isaac (Gen. xxii.), and on this mount they still perform the yearly paschal sacrifice. See Samaritans.

EBB. See Tide.

EBBON, ĕb′bôɴ′ (775-850). A French archbishop. He was the foster-brother of Louis le Débonnaire, son of Charlemagne, and was created Archbishop of Rheims by that prince. He made three voyages to Denmark and helped to establish Christianity there. When Lothaire revolted against his father the Archbishop took his part. Upon the King's return to power Ebbon fell into disgrace, and it was not until Lothaire became Emperor that he attempted to regain his bishopric. The Pope refused to reinstate him and he took refuge with Louis of Bavaria, and was made by him Bishop of Hildesheim in Saxony.

EBBW VALE, ĕb′bōō văl. A town of Monmouthshire, England, about 9 miles west-southwest of Abergavenny, in the centre of a coal and iron mining district (Map: England, D 5). Population, in 1891, 17,300; in 1901, 21,000.

EBE, ā′be, Gustav (1834—). A German architect, born at Halberstadt. He studied in Berlin, and then traveled in France and Italy. In company with Julius Benda, with whom he was associated in Berlin, he executed plans for the Vienna Rathaus, which obtained the first prize in competition, but were not executed. He was later active in Berlin, where he designed numerous structures, including the Tiele-Winckler

Palace (the headquarters of the Spanish embassy), and the Apollo Theatre. He is also the author of a work on art, *Die Spätrenaissance* (1886), a history of European art from the middle of the sixteenth century to the end of the eighteenth.

EBEL, ā′bel, Hermann Wilhelm (1820-75), a German Celtic scholar. He was born in Berlin, was educated at Halle, and was a member of the philological faculty of the Berlin University from 1872 to 1875. He was the foremost authority on Celtic philosophy in Germany, and his researches on the grammatical construction and lexicography of Irish, Manx, Welsh, Cornish, Breton, and ancient Gaelic give him a permanent place in the field of philology. Besides his principal work, a new and improved edition of Zeuss's *Grammatica Celtica* (1871), he published *De Verbi Britannici Futuro ac Conjunctivo* (1863; partly translated into English by W. K. Sullivan under the title *Celtic Studies*), and *De Zeusii Curis Positis in Grammatica Celtica* (1869).

EBEL, Johann Gottfried (1764-1830). A German writer on geography, born at Züllichau, Prussian Silesia, and educated at the University of Frankfort-on-the-Oder. His translation of the works of Sieyès, and his close association with certain revolutionary leaders of France, made him unpopular with the authorities of Frankfort-on-the-Main, and in 1796 he was banished from that city, where he had begun a medical practice. He subsequently lived in Paris and in Zurich, where his services in behalf of the maintenance of the Swiss Republic, which was endangered by the prevailing political conditions, were rewarded by an offer of citizenship on the part of the municipality of Zurich, in which city he spent the last years of his life. His principal works are the following: *Anleitung auf die nützlichste Art die Schweiz zu bereisen* (8th ed. 1842); and *Ueber den Bau der Erde in den Alpengebirgen* (1808).

EBEL, Johannes Wilhelm (1784-1861). A German Protestant clergyman, born at Passenheim, East Prussia. As pastor at Königsberg he became the founder of a mystic and theosophical society which counted among its members many representatives of the nobility. Accusations of gross immorality caused a judicial investigation of the society, with the result that it was dissolved and its organizer removed from office (1839). A subsequent investigation, however, showed that the charges of secret vice, disturbance of domestic peace, and pious fraud brought against the members of the association were not proved.

EBELING, ā′be-lĭng, Adolf (1827-96). A German author, born in Hamburg. He studied at the university of Heidelberg, and became a professor in the Commercial High School in Paris. In 1870 he returned to Germany, and edited for a time the Düsseldorf *Deutsches Künstleralbum*. From 1874 to 1878 he was a professor in the military school at Cairo. His publications include: *Bruchstücke aus der Beschreibung einer Reise nach Brasilien* (1849); *Bilder aus Kairo* (1878); and *Napoleon III. und sein Hof* (1891-93).

EBELING, Christopher Daniel (1741-1817). A German scholar, born in Hildesheim. He early devoted himself to geographical studies. The Congress of the United States gave him a vote of thanks for his great work, *The History and Geography of North America* (1793-99). While preparing this work he made a collection of about 4000 books and 10,000 maps, which was purchased in 1818 by Israel Thorndike and presented to Harvard University.

EB′ENE′ZER (Heb., *Eben-haʿezer*, the stone of help). The name of a place marked by a monumental stone set up by Samuel in recognition of divine assistance in a battle with the Philistines (I. Sam. vii. 10-12). Two earlier battles were fought at this place between the Israelites and the Philistines, in both of which the Israelites were beaten, and in the second of which the Ark of the Covenant was captured (I. Sam. iv. 1-2, 3-11). The location of the place cannot be satisfactorily determined.

EBENSBURG, ĕ′benz-bûrg. A borough and the county-seat of Cambria County, Pa., 16 miles (direct) west of Altoona, on a branch of the Pennsylvania Railroad (Map: Pennsylvania, C 3). It has some reputation as a resort, being situated in the Alleghanies, about 2025 feet above sea-level. The industries include sawmills, tanneries, woolen-mills, a foundry, etc. Population, in 1890, 1202; in 1900, 1574.

E′BER. See Hebrews.

EBERHARD, ā′bẽr-härt, im Bart (1445-96). The fifth Count and first Duke of Württemberg. He was the son of Count Louis the Elder, and succeeded his brother at the age of twelve; at fourteen he wrested the government from his uncle Ulrich, who had been appointed his guardian. He paid no attention to government affairs, but indulged his passions and led a dissipated life. In 1468 he made a pilgrimage to Jerusalem, after which he abandoned his reckless mode of living, and ruled well. He married Barbara of Mantua, whose influence over him contributed largely to the elevation of his character. He began to study, gathering around him men of learning, and founded, in 1477, the University of Tübingen. In 1482 Eberhard, by the Treaty of Münsingen, put an end to the division of his principality, made in 1437 between his father and his uncle Ulrich as representatives of the two lines of Urach and Stuttgart. By this treaty he secured the future integrity of Württemberg and established the right of primo-geniture in his own family; he became at the same time the founder of the representative Constitution of Württemberg. He made Stuttgart his place of residence, and improved the conditions of the convents in his territories. Although he preferred peace, he was an able warrior. His courage and his fidelity to his engagements secured the esteem and friendship of the emperors Frederick III. and Maximilian I. In recognition of his services the latter, in 1495, raised Eberhard to the dignity of duke, confirming at the same time all the possessions and prerogatives of his house. He died February 24, 1496. Consult Bossert, *Eberhard im Bart* (Stuttgart, 1884).

EBERHARD, Christian August Gottlob (1769-1845). A facile German poet and romancer, born at Belzig. The more noteworthy of his many works are the often reprinted idyl, *Hannchen und die Küchlein* (1822), and *Der erste Mensch und die Erde* (1828).

EBERHARD, Johann August (1739-1809). A German philosophical writer. He was born at Halberstadt, studied theology at Halle from 1756 to 1759, and after spending several years as a preacher in Berlin and Charlottenburg became professor of philosophy at Halle in 1778. Among his writings were treaties on ethics, æsthetics, the history of philosophy, and synonymy; especially notable were the *Neue Apologie des Socrates* (1772-73) and *Allgemeine Theorie des Denkens und Empfindens* (1776). He was a Leibnitzian, and toward the close of his life struggled, but without success, against the speculative views of the new schools of philosophy headed by Kant and Fichte.

EBERLE, ā'bẽr-*le*, Robert (1815-60). A German animal and landscape painter, born at Meersburg on Lake Constance. At first a pupil of Jakob Biedermann at Constance, he went to Munich in 1830, where he was much influenced by the works of Ruysdael and Dujardin in the Pinakothek. In 1848 he spent three months in America, but he returned to Munich, where he died from the effects of an accidental pistol-shot. He is particularly noted as a painter of sheep. His pictures are distinguished for good drawing and striking light effects. Among the most noteworthy are: "Shepherd Killed by Lightning Beside His Flock" (1842), Copenhagen Gallery; "Sheep and Cattle in Stable," Leipzig Museum; "Suabian Shepherd with Flock" (1853), Pinakothek, Munich; "Sheep Driven Over Precipice by an Eagle" (1858), Karlsruhe Gallery. His son Adolf (1843—), born in Munich, is equally successful as a genre and animal painter. He studied at the Munich Academy, especially under Piloty. One of his best rural genre scenes, the "Seizure of the Last Cow" (1861), is in the Hamburg Gallery. Others are: "After the Baptism" (1868), for which he was awarded a medal in Vienna; "The First Deer" (1879); "Forester's Belated Dinner" (1888); "A Lucky Catch" (1891).

EBERLEIN, ā'bẽr-līn, Gustav (1847—). A German sculptor, born at Spiekershausen (Hanover). He studied at the Art Academy of Nuremberg, and allied himself with the so-called realistic group of Berlin sculptors, of which Reinhold Begas (q.v.) is the chief representative. His best work has been done in imitation of the genre sculptures of ancient art, and includes such subjects as "Greek Flute-Player," "Psyche," "Wounded Nymph," and "The Archer." He also executed statues of the Emperor William I. at Elberfeld, Geislingen, Mannheim, Altona, and Ruhrort, and one of Frederick I. for the "Siegesallee," in Berlin. He published in 1892 *Aus eines Bildners Seelenleben, Plastik, Malerei und Poesie.* Consult Rosenberg, *Eberlein* (Bielefeld, 1903).

EBERNBURG, ā'bẽrn-bōōrk. A village in the Bavarian Palatinate, situated at the junction of the Alsenz with the Nahe, about 20 miles southwest of Mainz (Map: Germany, C 4). It is notable on account of its castle, which once belonged to the famous knight Franz von Sickingen, a devoted friend of the early Reformers. His stronghold, considered impregnable in olden times, afforded a secure retreat from danger and persecution to Melanchthon, Schwebel, Bucer, Œcolampadius, and also Ulrich von Hutten, the most distinguished bard of the Reformation and apostle of German unity. Hutten composed several of his works here. The castle was destroyed by the French in 1794. In 1841 it was rebuilt in its quaint ancient style. It now serves as a pleasure resort. The Hutten-Sickingen monument, half way up the hill, was unveiled in 1889. Population of village, in 1900, 818.

EBERS, ā'bẽrs, Emil (1807-84). A German genre painter, born in Breslau. He was a pupil of the Düsseldorf Academy, where he was much influenced by Lessing, Jordan, and Ritter. In company with the latter two he visited the coasts of Holland and Normandy, and became much interested in the life of smugglers, fishermen, and sailors, from which the subjects of his best pictures are chosen. He also painted humorous military scenes. His works show good composition, careful study of detail, and harmonious coloring. The most noteworthy are: "Smugglers About to Land" (1830), National Gallery, Berlin; "Rescued Woman Among Fishermen" (1841); "Pilot Boat" (1845); and "Mutiny on a Brig" (1848), Breslau Museum.

EBERS, Georg Moritz (1837-98). A German Egyptologist and novelist, born in Berlin. In 1856 he entered the University of Göttingen as a student of law, but soon became interested in Egyptology and devoted himself to that study in Berlin under Lepsius, Brugsch, and Böckh. Receiving his degree in 1862, he spent the next three years at work in the principal Egyptological museums of Europe. In 1865 he became lecturer, and in 1869 associate professor of Egyptology at Jena. In 1869 and 1870 he traveled extensively in Egypt and Nubia, and in the latter year accepted a call to Leipzig as associate professor. Two years later he again visited Egypt, where he discovered the celebrated hieratic medical papyrus, since known as the *Papyrus Ebers.* Dating from about 1550 B.C., it is one of the best preserved Egyptian papyri in existence, and forms the chief source of information in regard to the medical knowledge of the ancient Egyptians. A facsimile (110 plates) was published in 1875 by the discoverer, with an introduction written by himself and a hieroglyphic-Latin glossary by L. Stern. The papyrus is now in the library of the University of Leipzig. Among Ebers's scientific works may be mentioned his *Disquisitiones de Dynastia XXVI. Regum Ægyptorum* (1865), and *Aegypten und die Bücher Mosis* (1868). His *Durch Gosen zum Sinai* (1872, 2d ed. 1881) is partly of a popular character. He also wrote *Aegypten in Wort und Bild* (2d ed. 1880, 2 vols., illustrated), and *Richard Lepsius, ein Lebensbild* (1885). Ebers's reputation as a novelist was established by his *Eine ägyptische Königstochter* (1864), a charming picture of Egyptian life at the time of the Persian conquest. Of his later novels, *Uarda* (1877), *Homo Sum* (1878), *Die Schwestern* (1879), *Der Kaiser* (1880), and *Serapis* (1885) deal with periods of Egyptian history. Others of his novels, among them *Die Frau Bürgermeisterin* (1881) and *Ein Wort* (1882), are located either in Holland or South Germany, in the sixteenth century, while his *Eine Frage* (1881) is an idyl of ancient Greek life. In 1876 Ebers became partially paralyzed, and for the rest of his life suffered from continued ill health. He usually spent the summer at his country place at Tutzing, near Munich, and there he died. An excellent sketch of Ebers by the historian Eduard Meyer is to be found in *Biographisches Jahrbuch und deutscher Nekrolog*, vol. iii. (Berlin, 1898).

EBERSWALDE, ā′bērs-väl′de. A town of the Prussian Province of Brandenburg, situated on the Finow Canal, about 27 miles north-northeast of Berlin (Map: Prussia, E 2). It has become a favorite summer resort on account of its delightful situation, in the midst of fine groves and pine forests. It has mineral springs. It is an industrial centre, having extensive manufactures of railway cars and locomotives, horseshoe nails, roofing, felt, and cement. Pop., in 1890, 16,114; in 1900, 21,619; in 1905, 23,846.

EBERT, ā′bĕrt, Adolf (1820-90). A German philologist, born at Cassel. He studied at Marburg, Leipzig, Göttingen, and Berlin, became professor at Marburg, and in 1862 professor of Romance philology at Leipzig. From 1862 to 1873 he also held the chair of English philology. His most important work is his *Allgemeine Geschichte der Litteratur des Mittelalters im Abendlande* (1874-87). In 1859 he established with Ferdinand Wolf the *Jahrbuch für romanische und englische Litteratur*, to the first five volumes of which he contributed. His study was directed chiefly toward an examination of the connection between the Romance literature of the Middle Ages and the Latin and German literature of the same period.

EBERT, Karl Egon (1801-82). An Austrian poet. He was born at Prague, and was educated there and at Vienna, and after filling several positions settled in Prague. His chief works are his *Dichtungen* (1824; 3d ed. 1845); *Wlasta, ein böhmisch-nationales Heldengedicht in drei Büchern* (1829); and *Das Kloster, idyllische Erzählung in fünf Gesängen* (1833); *Bretislaw und Jutta* (1835); a collection of sonnets entitled "Ein Denkmal für Karl Egon, Fürsten von Fürstenberg" (1855); and the didactic poem "Fromme Gedanken eines weltlichen Mannes" (1859). He likewise wrote a large number of dramas, of which *Das Gelübde* was the best. His poetical works were published in seven volumes (1877).

EBERTH, ā′bĕrt, Karl Josef (1835—). A German bacteriologist and anatomist. He was born at Würzburg, studied at the university there, became professor of pathological anatomy at Zurich in 1865, and in 1881 was called to a similar chair at Halle. The results of his anatomical researches, including "Ueber den Peitschenwurm" (1859) and "Ueber Nematoden" (1863), appeared chiefly in Rudolph Virchow's *Archiv für pathologische Anatomie*. His investigations as a bacteriologist have to do principally with the bacillus of typhoid fever.

EBINGEN, ā′bĭng-*en*. A town in Württemberg, Germany, 37 miles south of Tübingen by rail, situated amid beautiful hill scenery. It has manufactures of woolens, clothing, etc. Population, in 1900, 9001; in 1905, 10,013.

EBIONITES, ē′bĭ-ō-nīts (Lat. *Ebionitæ*, from Heb. *'ebyonim*, poor). A name originally designating all Christians, contemptuously applied to them on account of their poverty. Later the name was employed, because of its Hebrew origin, to designate Christians of Jewish blood. Still later, when Jewish Christians had separated from the great body of the Church and displayed heretical tendencies, the name was appropriated to them. Isolated as they now were, they fell into a number of sectarian divisions, to one of which in particular the term was sometimes confined (in distinction from another sect called the 'Nazarenes'). Irenæus describes the Ebionites as Jewish Christians who hold to the Mosaic law, reject Paul as an apostate, and employ the Gospel of Matthew, but reject the miraculous birth, and regard Christ as a mere man. Origen styled all Jewish Christians Ebionites, and distinguished two classes, one of which accepted and the other denied the virgin birth. The most detailed accounts are found in Epiphanius, *Against Heretics*. They lingered in Palestine and Syria till the fifth century, but were few and unimportant after the second. See Clement of Alexandria; Essenes; Old Catholics.

EB′LIS. See Iblis.

EBNER-ESCHENBACH, āb′nĕr ĕsh′*en*-bäG, Marie, Baroness von (1830—). An Austrian novelist, dramatist, and poet. Born a Countess Dubsky at Castle Zdislawitz, Moravia, she married, in 1848, an Austrian officer, who died in 1898. She lived alternately at her birthplace and in Vienna. Her first publications are dramas now unimportant. Her fiction, which attracted immediate attention, begins with *Erzählungen* (1875). This was followed by *Božena* (1876); *Neue Erzählungen* (1878); *Dorf- und Schlossgeschichten* (1884); *Zwei Comtessen* (1885); *Neue Dorf- und Schlossgeschichten* (1886); *Das Gemeindekind* (1887); *Lotti die Uhrmacherin* (1889); *Ein kleiner Roman* (1889); *Miterlebtes* (1890); *Unsühnbar* (1890); *Margarete* (1891); *Drei Novellen* (1892); *Glaubenslos?* (1893); *Das Schädliche* and *Die Totenwacht* (1894); *Rittmeister Brand* and *Bertram Vogelweid* (1896); *Alte Schule* (1897); *Aus Spätherbsttagen* (1901); *Agave* (1903); *Die arme Kleine* (1904). She wrote also a popular collection of *Aphorismen* (1880), and verses collected as *Parabeln, Märchen und Gedichte* (1892). Her collected works were published in 1893-1901. Her work is distinguished for its power of description, its psychological insight, its humor, wit, and polished precision of style. Her sense of proportion in novelistic construction has also been highly praised. For her biography, consult: Necker (Berlin, 1900), and Bettelheim (ib., 1900).

EBOLI, ĕb′ō-lē (Lat. *Ebura*). A city in South Italy, 50 miles southeast of Naples (Map: Italy, K 7). It is picturesquely situated on a hill a few miles from the Gulf of Salerno, of which it has a magnificent view. From it the princely House of Eboli was named. Population, in 1901, 12,407.

EBOLI, Anna de Mendoza, Princess of (1540-92). A Spanish courtier, with the further titles of Duchess of Francavilla and Princess of Melito. She was a prominent and influential figure at the Court of Philip II. of Spain, and played a conspicuous rôle in many of the intrigues of the time. She is best known as a character in Schiller's drama *Don Carlos*.

EB′ONY (older form *ebon*, OF. *ebene*, Lat. *ebenus*, Gk. *ἔβενος*, *ebenos*, ebony; probably of Sem. origin; cf. Heb. pl. *hābnim*, ebony, lit. dark, ultimately probably of Egyptian origin).

The hard, heavy, and dark-colored heart-wood of a number of species of trees. The genus Diospyros, of the order Ebenaceæ, is the source of most of the ebony of commerce. The best quality is obtained from Diospyros ebeneum, a large tree of India, Ceylon, and other tropical countries. Logs of ebony of this species, 10 to 15 feet in length, with the heart-wood 2 feet in diameter, are common. Ebony of good quality is obtained in Coromandel from Diospyros melanoxylon, and also from Diospyros tomentosa and other species of India, Madagascar, and Mauritius. The Calamander wood is from Diospyros hirsuta; the Cadoobergia wood is a peculiar kind of wood with striped effect obtained from Diospyros ebeneum. Ebony is furnished by the allied Maba ebenus of Molucca, and by a number of trees of the order Leguminosæ. Among these latter may be mentioned a variety obtained in Abyssinia from Millettia, and the West Indian ebony (*Brya ebenus*). The American species of Diospyros (Diospyros Virginiana and Diospyros Texana) often supply a fairly good quality of ebony. The wood is chiefly used as a veneer by cabinet-makers. It is very heavy, and takes a high polish. The beauties of this wood were well known to the Greeks and Romans, who inlaid it with ivory for contrast. It is mentioned in the Scriptures as an article of Tyrian importation. The wood is somewhat pungent, and was once thought to have medicinal value. Ebony is exported in considerable quantity from Egypt, Zanzibar, Madagascar, Mauritius, Ceylon, India, and Jamaica. What is known as 'bastard ebony' is exported in considerable quantities from Brazil. It is produced by the tree Jacaranda ovalifolia. True ebony wood is so intensely dark in color that the term 'black as ebony' is a well-known colloquialism. See JACARANDA WOOD.

EBOR′ACUM. See YORK.

EBRARD, ā′brärt, JOHANNES HEINRICH AUGUST (1818-88). A German Reformed theologian and miscellaneous writer. He was born at Erlangen, January 18, 1818. He studied at Erlangen and Berlin, became professor at Zurich in 1844, at Erlangen in 1847, removed to Speyer in 1853, but in 1861 returned to Erlangen and resumed his lectures. From 1875 he was pastor of the French Reformed Church at Erlangen. He was a voluminous writer both in theology and lighter literature. Those of his theological works translated into English include *The Gospel History* (1863), and *Apologetics* (1886-87). He also published: *Die iro-schottische Missionskirche des sechsten bis achten Jahrhunderts* (1873); *Bonifatius, der Zerstörer des columbanischen Kirchentums auf dem Festlande* (1882); *Lebensführungen* (1888); and many dramas, poems, etc. When writing upon non-theological subjects he generally used a pseudonym—Christian Deutsch, Gottfried Flammberg, or Siegmund Sturm. He died at Erlangen, July 23, 1888.

E′BRO (Lat. *Iberus*). One of the largest rivers of Spain, rising in the Province of Santander, in the north central part of the country, on the southern slope of the Cantabrian Mountains (Map: Spain, E 2). After a tortuous course in a southeasterly direction of about 450 miles, it empties into the Mediterranean at Cabo de Tortosa. It drains an area of about 30,000 square miles, and has a delta which extends far into the sea. Its mouth is choked up with sand, and, to render it navigable, a canal called the San Carlos has been carried through the southern side of the delta. Its principal affluents are the Najerilla, Jalón, Huerva, and Guadalope from the right, and the Aragon, Gallego, and Segre from the left, which drain the southern slopes of the Pyrenees. The course of the Ebro is chiefly through narrow and sometimes rocky valleys; its bed is characterized by many shoals and rapids which interrupt the navigation. This is partly remedied, however, by means of the Imperial Canal, which extends from the vicinity of Tudela to a point 40 miles below Saragossa, the principal city on the river.

EBSTEIN, ĕp′stīn, WILHELM (1836—). A German physician, born at Jauer, Silesia. He was educated at Breslau and Berlin, and in 1874 became professor of medicine at the University of Göttingen and director of the Medical Polyclinical Institute at that institution. His writings, several of which contain valuable suggestions as to dietetic cures, include "Nierenkrankheiten," vol. ix. of Ziemssen's *Handbuch* (2d ed., 1878); *Die Fettleibigkeit (Korpulenz) und ihre Behandlung nach physiologischen Grundsätzen* (7th ed., 1887); *Die Kunst das menschliche Leben zu verlängern* (1891); *Lebensweise der Zuckerkranken* (2d ed., 1898); *Handbuch der praktischen Medizin*, with Dr. Julius Schwalbe (1898).

EBULLITION, or BOILING. See HEAT.

EBUL′LIOSCOPE (Lat. *ebullire*, to boil, from *e-*, out + *bullire*, to bubble, from *bulla*, bubble + Gk. *σκοπεῖν*, *skopein*, to look). An apparatus for ascertaining the strength of distilled liquors by observing the boiling-point and the atmospheric pressure.

EÇA DE QUEIROZ, ā′sä dā kā′ē-rōsh, JOSÉ MARIA (1845-1900). A Portuguese author, born at Povoa do Varzim. He was educated at the University of Coimbra, was a collaborator on the staff of *As Farpas*, a critical journal, in 1871, and was appointed Portuguese consul successively at Havana, Newcastle, Bristol, and Paris. His best-known publications are his works of prose fiction, *O crime do Padre Amaro* (1874; thoroughly revised edition, 1880), *O primo Basilio* (1877; in French translation by Rattazzi-Ruth, German by C. and H. Michaelis), and *A Reliquia* (1886; 2d ed. 1891).

ÉCARTÉ, ā′kär′tā′ (Fr., discarded, p.p. of *écarter*, to discard, from Lat. *ex*, out + *charta*, Gk. *χάρτης*, *chartēs*, paper). A game of cards usually played by two persons, though, in the form called pool écarté, three or even more may take part in it. In this case the third player takes the place of the loser in the first game, and the pool accumulates until one player wins two (or three) games in succession. In French écarté, bystanders are permitted to advise, and the player losing leaves the table, his adviser taking his place. If, however, the loser is playing *la chouette* (i.e. taking all bets offered), he need not retire on losing. The sixes, fives, fours, threes, and twos are removed from a pack, and the player cutting highest deals. He gives five cards, by two and three at a time, to his opponent and himself, and turns up the eleventh card for trumps. The trump card, if a king, counts one for the dealer. His adversary, if satisfied with his hand, plays; if not satisfied, proposes, which means, briefly, that he wishes to get rid of poor cards and take up others from the stock, and the dealer can accept or refuse. Should he accept, each may discard, face downward, as many cards as he may choose, receiving fresh ones from the cards yet undealt, these being given first to the non-dealer till his hand is complete. A second proposal and a third may be made, and so on till the player is satisfied; but if the dealer refuse, the hand must be played without discarding. The king of trumps scores one if in either hand. The non-dealer being satisfied with his hand, leads; the dealer follows, and the trick is taken by the highest card or the trump. The king is the highest. The winner of a trick leads to the next. The second player must follow suit, and must win the trick if he can. The game is scored by the king, as explained, and the majority of tricks. Three tricks score one for the point; all five tricks won by one player score two for the *vole.* When the non-dealer does not propose, or his proposal is refused, and he fails to gain three tricks, the dealer scores two, but no more, even though he win the *vole.* The game is five up. Consult: 'Cavendish,' *Pocket Guide to Ecarté* (London, 1870); *The Laws of Ecarté Adopted by the Turf Club* (London, 1878).

ECBAT'ANA (OPers. *Hangmatāna,* written *Hagmatāna,* probably place of assembly, from *ham,* Skt. *sam,* together + *gam,* to come; Babyl. *Agamatanu, Agamtanu,* Heb. *Achmĕtha,* Lat. *Ecbatana,* Gk. 'Εκβάτανα, *Ekbatana,* 'Αγβάτανα, *Agbatana*). The ancient capital of Media. It was situated at a distance of 12 stadia (about 1½ miles) from Mount Orontes, the modern Elvend. It lay upon a conical hill, crowned by a temple of the sun, and was inclosed by seven concentric walls, the innermost of which was gilded and the next plated with silver; while the rest, in their order outward, were painted orange, blue, scarlet, black, and white. The city is said to have been nearly 30 miles in circumference. Its principal buildings were the citadel—a stronghold of enormous dimensions, where also the archives were kept in which Darius found the edict of Cyrus the Great concerning the rebuilding of the temple at Jerusalem—and the royal palace. The mild climate and the magnificence of its structure singled out Ecbatana as the favorite summer residence, first of the Median, then of the Persian, and lastly of the Parthian monarchs. After the battle of Arbela (B.C. 331), Alexander followed Darius thither and secured immense booty. It was again pillaged by the Seleucidæ; but such were the riches of this place that Antiochus the Great still found 4000 talents' worth of silver, equivalent to more than $4,000,000, to carry away. Ecbatana subsequently fell into the hands of the Parthians, and it has since so utterly sunk into decay that its site can no longer be fixed upon with certainty. But nowadays, scholars generally agree that the present Hamadan, with the reputed tombs of Mordecai and Esther (see HAMADAN), occupies the site of ancient Ecbatana. Excavations on the site would no doubt yield valuable finds in the way of antiquities. There was another Ecbatana in Persia, which was given to the Magi, and a third in Syria, at the foot of Carmel, the present Haifa, where Cambyses, the son of Cyrus, died.

ECCARD, ĕk'kärt, JOHANNES (1553-1611). A German composer of Church music. He was born at Mühlhausen (Thuringia), was a pupil of Orlando Lasso at Munich, and became assistant conductor in 1583 and chapelmaster in 1599 at Königsberg. In 1608 he was chief conductor of the Elector's chapel in Berlin. His songs, cantatas, and chorales live by reason of their harmony and religious feeling. Among the collection of his songs are "Geistliche Lieder" (1579), and "Preussische Festlieder" (1642, posthumous).

ECCE HOMO, ĕk'sē hō'mō (Lat., Behold the Man). This expression is derived from the words spoken by Pilate on showing Christ to the multitude (John xix. 5) previous to His being led forth to crucifixion, and is applied to paintings representing Christ bound and crowned with thorns. One of the finest "Ecce Homos" is that of Correggio, in the National Gallery in London, but the best known are those of Guido Reni.

ECCE HOMO: A STUDY OF THE LIFE AND WORK OF JESUS CHRIST. A religious work by John Robert Seeley, professor at Cambridge University, England, which appeared anonymously in 1865, and was designed to show the humanity of Christ. Its contents created some controversy within the Protestant Church.

ECCENTRIC (from Lat. *eccentros,* Gk. ἔκκεντρος, *ekkentros,* eccentric, from ἐκ, *ek,* out + κέντρον, *kentron,* centre). A mechanical contrivance for obtaining an alternating rectilinear motion from a revolving shaft. It consists of a circular disk fixed on a shaft in such a position that the latter does not pass through the centre of the disk. The disk, which has a groove upon its circumference, is surrounded by a hoop to which is attached a rod. As the eccentric revolves with the shaft, the hoop is alternately raised and lowered, thus imparting a to-and-fro motion to the rod. The extent of the rise and fall of the rod is equal to twice the distance between the centres. The eccentric is chiefly used where a subsidiary motion of small power is required—as for working the force-pump that supplies the boiler of a steam-engine, or for operating slide-valves for steam-engines. See CRANK; CAM; STEAM-ENGINE.

ECCENTRIC, or ECCENTRIC CIRCLE. It was a fundamental doctrine with the ancient astronomers that every heavenly body moved in a circle ('the perfect figure') and at a uniform rate. But some of them appeared to move unsteadily, and in other figures than circles. Of course, this was considered a mere deceptive appearance. To explain it, they invented the 'eccentric circle.' Suppose a body, such as the sun, to move in a circle at a uniform rate. To an observer at the centre of the circle, the uniformity of the motion is evident—i.e. the sun is seen to travel through equal angular distances in equal times. But to an observer situated at some point half way between the centre of the circle and the circumference, the angular distances traveled through in equal times appear unequal. If, then, the earth, instead of being at the centre of the sun's orbit, be supposed to occupy a position away from it, the want of regularity in the sun's movements is explained. Accordingly, to reconcile the observed fact with their fundamental doctrine, the ancients placed the earth at a point away from the centre of the sun's supposed orbit. The orbit itself was called 'the eccentric,' because its centre did not coincide with that of the earth, which was considered to be the centre of the universe.

ECCENTRICITY. A mathematical term used in connection with certain curves. The eccentricity of the hyperbola (q.v.) or of the ellipse (q.v.) is the ratio of the distance between the foci to the major diameter of the curve. The modern use of the term, however, extends to all conics, defining it as the ratio of the focal distance of any point on the curve to the distance from the directrix. Regarding the earth's orbit as an ellipse, its eccentricity is approximately 0.01677.

ECCHELLENSIS, or **ECHELLENSIS**, ĕk'-kĕl-lĕn'sĭs, ABRAHAM (?-1664). An Arabic scholar. He was born at Ekchel or Eckel (whence his name), Syria, near the close of the sixteenth century. He was educated in the Maronite College in Rome, and became professor of Arabic and Syriac in the College of the Propagandists. In Paris he assisted for a year (1640-41) in the preparation of Le Jay's Polyglot Bible. He published several Latin translations of Arabic works. He died in Rome, 1664.

ECCHYMOSIS, ĕk'kĭ-mō'sĭs (Neo-Lat., from Gk. *ἐκ*, *ek*, out + *χυμός*, *chymos*, juice, from *χεῖν*, *chein*, to pour). A discoloration of the surface, produced by blood effused below or in the texture of the skin, as in a black eye or bruise. It is usually attended by swelling to a greater or less extent, and is the result of injury.

ECCLEFECHAN, ĕk''l-fĕk'*a*n. A small village of Dumfriesshire, Scotland, 20 miles north of Carlisle (Map: Scotland, E 4). Thomas Carlyle was born and buried there, and the village is believed to be the 'Entepfuhl' of his *Sartor Resartus*.

ECCLES, ĕk'k'lz (from Lat. *ecclesia*, from Gk. *ἐκκλησία*, *ekklēsia*, church). A municipal borough of Lancashire, England, picturesquely situated on the Irwell and the Manchester Ship Canal, about four miles west of Manchester, of which it is practically a suburb (Map: England, D 3). It was incorporated in 1892. Its water-supply is derived from Manchester, and its gas from Salford. The town owns its electric plant and street-railway lines, the latter being operated by a private company; it maintains public baths, a market, cemetery, and recreation grounds. The chief industry is the manufacture of cotton goods. Population, in 1891, 29,700; in 1901, 34,400.

ECCLESFIELD, ĕk'k'ls-fēld. A town in the West Riding of Yorkshire, England, five miles north of Sheffield (Map: England, E 3). The chief manufacture is cutlery, but linen and nails are also produced. There are coal and iron mines in the vicinity. Population, in 1891, 26,000; in 1901, 24,100. The town derives its name from a very ancient church founded here probably as early as the Conquest.

ECCLESIA, ĕk-klē'zĭ-ȧ (Lat., from Gk. *ἐκκλησία*, *ekklēsia*, assembly, from *ἐκ*, *ek*, out + *καλεῖν*, *kalein*, to call). (1) A term commonly used to denote the popular assembly of the Athenians, in which all free citizens might vote. Its authority was supreme, though ordinarily only those citizens could be present who lived in the immediate vicinity of Athens, and 6000 was regarded as a large attendance. A popular assembly is part of the Greek State in the Homeric poems, but with the growth of the power of the nobles, such a body, if it existed at Athens, was seldom convoked and of no practical authority. Solon (B.C. 594) first made it a power by admitting to it all citizens, and giving it some power in the election of officials. With the establishment of the Clisthenian democracy, the supremacy of the ecclesia was firmly established. At first it seems to have met only once in each *prytany*, i.e. the period of 35 or 36 days, into 10 of which the Athenian year was divided, but later it met regularly four times in a *prytany*, while extra meetings could be called by the prytanes. The prytanes were the 50 senators of that one of the 10 tribes which at that time was acting as standing committee of the Senate. In the fifth century B.C., the *epistatēs* or chairman of the prytanes presided, but later a committee of nine, one from each of the other nine tribes, was chosen as *proedroi*, and presided over the meetings. Those who attended the ecclesia received pay probably after B.C. 400, at first one obol, later three oboli, and at last even six or nine. The ecclesia was opened with sacrifice and prayer, and then the business was laid before the assembly in the form of resolutions already adopted by the Senate. These were open to alteration to any extent, but no business might be presented to the assembly before passing the Senate. Any Athenian citizen might speak. The vote was regularly taken by show of hands; only when the decree affected a single individual were ballots used. When the business had been finished the prytanes dismissed the ecclesia. In Sparta, also, there was a popular assembly, called Apella (Ἀπέλλα), which met once a month, to vote on the proposals of the Council of Ephors. There was no free debate, and as a rule only the officials seem to have spoken. It is not known what was the nature of the little ecclesia at Sparta mentioned once by Xenophon. The voting at Sparta was by acclamation, and not by ballot. The majority was determined by the comparative volume of sound, or, if that was doubted, by a division and counting of the two parties. (2) In the Greek of the New Testament, ecclesia is the name for the company of Christ's disciples professing to trust Him as their Saviour and to obey Him as their Lord. It is applied to a small assembly of them, such as were members of one family, or could meet in a dwelling-house of ordinary size; to the whole number in one city or neighborhood; to the whole number on earth; to all that are in heaven; and to the innumerable company on earth and in heaven. It has other meanings, but is usually rendered *Church*.

ECCLESIASTES, ĕk-klē'zĭ-ăs'tēz (Lat., from Gk. *ἐκκλησιαστής*, *ekklēsiastēs*, one concerned with an assembly, from *ἐκκλησία*, *ekklēsia*, assembly). A philosophical book belonging to the third division of the Old Testament collection known as Hagiographa. The Hebrew name is *Koheleth*, which is translated into Greek as *Ecclesiastes*, on the supposition that the Hebrew stem underlying *Koheleth* is to be taken in the sense of assembly, so that *Koheleth* is one who addresses or convenes an assembly, i.e. a preacher. This explanation of the name, however, is doubtful, a strong objection to it being that it does not account for the feminine ending which the Hebrew word exhibits. To assume, as some scholars are inclined to do, that the speaker is 'personified wisdom' (and hence the feminine) is not satisfactory, since nowhere is wisdom mentioned as the speaker. Various other explanations have been brought forward, none of which, however, has met with general acceptance. *Koheleth* impresses one as an intentional disguise, and therefore a more or less artificial formation, and since *kahal* is a characteristic Hebrew word for 'congregation,' it is not impossible that by inventing the form *Koheleth*, the author intends to carry the idea of anonymity. *Koheleth* would thus be about the equivalent of our anonymous.

The book itself consists of twelve chapters, forming a series of discourses on the vanity of earthly things, and is put into the mouth of *Koheleth*, who describes himself as "a son of David, King in Jerusalem" (i. 1). Whether Solomon was originally in the mind of the author is not certain, for 'son of David' may be an interpolation; but it is probable, for, to the Jews of the post-exilic period, to which Ecclesiastes belongs, Solomon had become the ideal of a king endowed with wisdom, riches, and power, and who, therefore, could properly be chosen as an illustration for the central doctrine of the author's philosophy. To prove the theory of the vanity of life it was necessary to choose some one who could represent life in all its manifestations. Solomon was such a man, and the author's argument is that if Solomon came to the conclusion that wisdom, pleasures, riches, power, were all vain, there could be no doubt about it. The introduction of Solomon by implication gave rise to the tradition which ascribed the authorship to Solomon. This tradition prevented a proper understanding and gave rise to methods of interpretation that disguised the real character of the book, which is undoubtedly skeptical. Everything is questioned—the value of virtue, immortality, divine justice, the providence of God, the advantage of wisdom—in short, everything but the existence of God Himself. The character of the skepticism is peculiarly Oriental. The tone is the same that we find in Omar Khayyam, so that it is not necessary to assume an influence of Greek thought, though such influence undoubtedly existed at the time of the composition of Ecclesiastes. The book, however, must belong to a period of depression in the history of the Jews when internal conditions suggested a doubt as to the validity of the prophetical teachings which had emphasized God's providence for Israel, His justice and goodness, and the necessity of virtue and morality as a condition to securing divine favor and with it happiness. Such a period sets in toward the close of the Persian dominion, and the depression became accentuated from one age to the other, so that it is difficult to pick out any particular decade after the fourth century to which Ecclesiastes is more applicable than any other. Hence scholars vary considerably in assigning a date to Ecclesiastes; and, while some pass beyond the fourth century, several are inclined to bring the date of the composition down to the days of Herod. The language points to a late date. The Book of Daniel, with its optimism and its aim to encourage the Jews in the hour of greatest despair, is the antidote and antithesis to Ecclesiastes, and, except for the fact that an author might fear to produce so pessimistic a work in such perilous times as the days of Antiochus Epiphanes, one is tempted to suppose that the two books were written in the same period.

Ecclesiastes became a popular book, much to the alarm of pious Jews, who shrank from its skeptical tone and conclusions. Hence the attempt was made to tone down its most audacious utterances, to intersperse liberally throughout the book phrases indicative of the author's piety, and above all, by adding a pious conclusion, to give to the book a religious tone. This was done with such success that the skeptical tone was disguised and the book, though not without discussion by the Jewish rabbis, was admitted into the canon.

Consult the commentaries of Graetz, Delitzsch, Renan, Plumptre, Wright, Hitzig, and Ewald; also Cheyne, *Job and Solomon* (1887); Palm, *Die Kohelet Litteratur* (Mannheim, 1886); Schiffer, *Das Buch Kohelet nach der Auffassung der jüdischen Weisen des Talmuds* (Leipzig, 1884); Bickell, *Koheleths Untersuchungen über den Werth des Daseins* (Innsbruck, 1886); Dillon, *Skeptics of the Old Testament* (London, 1895).

ECCLESIASTICAL COMMISSIONERS FOR ENGLAND. A corporate body established by act of Parliament constituting an important administrative agency for the Established Church of England. The commissioners are about fifty in number, and include all the bishops of the Established Church in England and Wales, the deans of Canterbury, Saint Paul's, and Westminster, and five Cabinet Ministers, in addition to twelve lay members, appointed partly by the Crown and partly by the Archbishop of Canterbury. They are required to lay before the Crown in council such plans as appear to them best adapted for carrying out the objects of their appointment. By acts subsequent to their organization, they now have authority to divide or unite existing parishes and to create additional jurisdictions, known as districts. At the time of their appointment, in order that they might be provided with funds to carry out their plans, the seven best-endowed sees of the Established Church were laid under a contribution which amounted to an annual sum of £22,800. In addition to the income thus provided, several canonries in various cathedrals and other ecclesiastical preferments were suppressed, and the entire emoluments were vested in the commissioners.

The commissioners expend their funds on church buildings, on the augmentation of poor livings, and on the endowment of new churches in new cures, called districts; and in so doing, though the fund they handle is a common one, they are bound to consider the needs of the places whence the income is derived. In the augmentation of poor livings the commissioners often contribute a certain sum on condition that the persons interested raise an equal sum. The average income of the English beneficed clergy at the present time is £249 per benefice, and the funds for the augmentation of the benefices would amount to about £3 each if they were equally distributed. Consult Whitehead, *Church Law* (London, 1892).

ECCLESIASTICAL CORPORATION. A body corporate constituted of an ecclesiastical person or persons and subject to ecclesiastical judicatories. Ecclesiastical corporations are divided into corporations aggregate and corporations sole. The former consist of several persons—as, for example, the head and fellows of a college, or the dean and chapter of a cathedral—and are perpetuated by a continuous succession of members. The latter consist of a single person and his successors in a certain office—as, for example, a bishop or rector. By the law of England, the holder of an ecclesiastical benefice is regarded as a corporation. The object of the law in regarding the incumbent of a benefice as a corporation sole is to preserve the temporalities vested in him, which would otherwise descend to his natural heirs. The right of a rector or other corporation sole to Church temporalities, although generally spoken of as a freehold in law, is in fact practically nothing more than a tenancy for life. Such a corporation sole is entitled to the full enjoyment of the benefice during his life, but he cannot sell it, and he is even punishable for waste.

The corporation for religious purposes, as it has developed in American law, bears little resemblance to the ecclesiastical corporation of the English law; for while the objects for which they exist are much the same, the American body is purely a civil corporation and subject to the civil tribunals. Of recent years provisions for the creation of ecclesiastical corporations sole have been introduced into the statutes of several States. See CORPORATION; CIVIL CHURCH LAW, AMERICAN.

ECCLESIASTICAL COURTS. Tribunals having jurisdiction more especially in causes relating to religion and to the discipline of religious bodies. Their origin is to be found in the first years of Christianity, when the Christians made every effort to settle their disputes among themselves and to maintain their discipline without resorting to the courts presided over by pagan officials. These primitive Christian courts developed around the bishops, who came to take cognizance of all causes, temporal as well as spiritual, among the brethren. Later still certain matters were assigned to them as proper causes for their especial jurisdiction, such as questions of taxation for the support of religion and matrimonial and testamentary causes. The character and extent of the jurisdiction of ecclesiastical courts must of necessity depend upon the relation subsisting between a State and the religious bodies within it. See ESTABLISHMENTS, ECCLESIASTICAL.

According to the leading authorities in this matter, no separate ecclesiastical courts existed in England before the Norman Conquest, as all causes, both civil and spiritual, were heard in the single county court, in which the bishop and the earl sat together. By a charter of William I. a distinction was made between courts civil and courts ecclesiastical, and authority was given to the bishops to hear ecclesiastical causes according to the canon law, which was imported from the Continent. The extent of the jurisdiction of these ecclesiastical courts became a chronic source of dispute between the English Crown and the See of Rome, until the jurisdiction of the Bishop of Rome was completely excluded by Henry VIII.

The ecclesiastical courts of England now consist of the following: The Archdeacon's, Consistory, Peculiars, Arches Court, and, in cases of appeal only, the Crown in Council. The Public Worship Regulation Act of 1874 created a new ecclesiastical judgeship, having jurisdiction mainly of offenses in matters of ritual. In 1857 the greater part of the ancient jurisdiction of the ecclesiastical courts was taken away, and it is now vested in the Probate, Divorce, and Admiralty divisions of the High Court of Justice. They have, however, still to deal with questions of Church government and discipline. If they in any manner exceed the limits of their jurisdiction, they are 'prohibited' by the High Court of Justice. The power of the ecclesiastical courts over the laity is now practically obsolete. The decrees of these courts are enforced by suspension, deprivation, degradation, and by imprisonment under a writ *de contumace capiendo.* In the Isle of Man the ecclesiastical courts still have, as they formerly had in England, jurisdiction in probate and matrimonial causes. In Scotland the chief ecclesiastical courts have been the General Assembly, the Commissary Court, and the Court of Teinds. The first is the highest tribunal for the consideration of questions of doctrine and discipline according to the Presbyterian usage of the Established Church. The courts of the American Church bodies are considered under the various denominational titles.

ECCLESIASTICAL HISTORY. See CHURCH HISTORY.

ECCLESIASTICAL LAW. See CANON LAW.

ECCLESIASTICAL TITLES ASSUMPTION ACT. An act of the Parliament of Great Britain for the protection of the Established Church of England. In the year 1850 an edict was issued by Pope Pius IX., dividing Great Britain into territorial bishoprics under an Archbishop of Westminster. This brief was immediately followed by a pastoral letter by the newly appointed Archbishop, Cardinal Wiseman. At the commencement of the Parliamentary session of 1851, this was spoken of as a Papal aggression, and the necessary measures to counteract it became the chief topics of discussion. It was under these circumstances that Lord John Russell introduced the Ecclesiastical Titles Bill. By a previous act it had been provided that the right and title of archbishops to their respective provinces, of bishops to their sees, and of deans to their deaneries, as well in England as in Ireland, having been settled and established by law, any person, other than the person thereto entitled, who should assume or use the name, style, or title of archbishop of any province, bishop of any bishopric, dean of any deanery, in England or Ireland, should for every such offense forfeit £100. The Roman Catholics claimed that this enactment struck only at the titles of existing provinces and dioceses, and that, while the Pope could not create an Archbishop of Canterbury, there was no prohibition against the creation of an Archbishop of Westminster. To meet this claim and to remove the doubt that existed, the Ecclesiastical Titles Act was passed, its object being to prohibit the assumption of such titles "in respect of any places within the United Kingdom." The Catholics always considered the penal clauses of this act to be a grievance, and in time an arrangement was made for its repeal. An act was passed which, after declaring that "no ecclesiastical title of honor or dignity derived from any see, province, diocese, or deanery recognized by law, or from any city, town, place, or territory within this realm, can be validly created," and that no "preëminence or coercive power can be conferred otherwise than under the authority of her Majesty," repealed the Ecclesiastical Titles Assumption Act as inexpedient. The result is that, while no prosecution can now be had for assuming such titles, this assumption is still treated by the law as an illegal act.

ECCLESIASTICUS, ĕk-klē′zĭ-ăs′tĭ-kŭs (Lat., from Gk. *ἐκκλησιαστικός*, *ekklēsiastikos*, relating to an assembly, from *ἐκκλησία*, *ekklēsia*, assembly). The Latin title of a biblical book called, in the Greek version, *The Wisdom of Jesus, the Son of Sirach*, and, in the original Hebrew, sometimes *The Wisdom of Ben Sira*, sometimes *The Proverbs of Ben Sira*. Books read in public, or regarded as suitable for that purpose, and therefore kept in places of assembly, were designated as *libri ecclesiastici*, or 'church books,' by the Latin Christians. When, largely through the influence of Jerome, books found in the Greek Bible, but not in the generally recognized Hebrew canon, began to be looked upon as only deutero-canonical, or even apocryphal, the term 'church books' was not improperly confined to the works still read and cherished by the Church, though rejected by the Synagogue. Among these, the *Wisdom of Jesus, Son of Sirach*, being used as a text-book in the instruction of catechumens, naturally became known as the 'church book' *par excellence;* hence the name *Ecclesiasticus*. The Hebrew original was widely read and greatly revered as a holy book in the days preceding the limitation of the canon. (See the heading *Canon of the Bible*, in the article BIBLE.) So strongly was it intrenched that, even after the canon had been reduced to twenty-two or twenty-four books, it still continued to be used and quoted as Scripture, particularly by the rabbis of Sora. Patriotic and mediæval writers, who, on the ground of its absence in the Hebrew Bible, regarded it as canonical only in a secondary degree, freely appealed to its authority in support of doctrine. Its canonicity was rejected by the Reformers, though it was still printed in their versions.

Until 1896 the Hebrew original was known only through quotations in rabbinic literature. Of these there were about eighty, amounting to perhaps one-twentieth of the entire text. Since the year mentioned fragments of four manuscripts have been discovered. All of these have come from the *geniza*, or hiding-place for worn-out copies of biblical books and esoteric or forbidden works in the Synagogue of Cairo. They cover about four-fifths of the book, and furnish in some instances two or three witnesses to the text. Numerous marginal notes also supply variant readings and doublets. Probably no one of the manuscripts is older than the eleventh century. One was evidently made by a Persian Jew, who occasionally put into the margin remarks in his own vernacular. There can be no reasonable doubt that all these manuscripts in the main represent the Hebrew original. But it is equally manifest that the text has been greatly corrupted, and in some cases has been corrected, or at least shaped, under the influence of either the Syriac version itself or an Aramaic targum closely resembling it. The ancient versions therefore remain of utmost importance. Of these, the Greek and the Syriac were made directly from the Hebrew; the Latin, the Syro-Hexaplaric, the Ethiopic, and the Coptic are the chief translations of the Greek. A prologue to the Greek version states that the author's grandson, who translated the work, came to Egypt in the thirty-eighth year of King Euergetes. This can only be Ptolemy Euergetes II., called Physcon, who was the only Euergetes reigning as long as thirty-eight years; the years of his reign are counted from the time when he first assumed power in B.C. 170. How long after the year B.C. 132 Ben Sira's grandson lived in Egypt before he was able to undertake the task of translating this book cannot be determined. But it is likely that the work was not completed until the time of Ptolemy Soter II., called Lathyrus, the first period of whose reign extended from B.C. 117-107. Another prologue of uncertain authority printed in the *editio princeps*, the Complutensian Polyglot, may not be older than the fourth century A.D., and draws its information from the work itself. Not even its independent statement that the translator's name was Jesus can be accepted on so doubtful authority. We are far from possessing the original of this translation. The text presented by the great uncial codices is much inferior to that followed by a group of cursives and one late uncial. Particularly the manuscript printed in the Complutensian has preserved an older and better text. Yet no codex has suffered more by interpolations than this very one. A curious displacement is found in all manuscripts. Without a single exception, they pass from xxx. 24 to xxxiii. 16, continue to xxxvi. 11, and then go back to the section xxx. 25-xxxiii. 15. This could not well have found its way into all manuscripts except through the authority and influence of some universally recognized codex. It is difficult to avoid the conclusion that this was Origen's Hexapla. The fact that the Syriac version of Paul of Tella uses the asterisk and obolus to indicate differences from some recognized original, renders it possible that Origen actually compared the Greek text of his book with a Hebrew copy. The displacement may have taken place before his time, and a different arrangement of his small books forming the volume even in this Hebrew copy may have facilitated the error. In some places the Latin and in others the Ethiopic has preserved an earlier and better reading than that found in any manuscript. The Syriac version is a translation from the Hebrew. Its often startling agreement with the recovered Hebrew text corroborates this conclusion. But it is evident that here and there it has suffered corruption. Originally made in all probability by a Jew, it subsequently passed through many Christian hands that have left their mark. And occasionally its agreement with the Hebrew seems to be due to the influence it has itself exerted on the latter. Though the facilities for textual criticism have thus been greatly enriched, considerable uncertainty still exists as to the original.

By the discovery of the Hebrew text, new questions have been raised as to the name of the author and the integrity of his work. The colophon (l. 27) designates as author Simeon, son of Jesus, son of Eleazar Ben Sira. The statement is repeated in chapter li., and also given in the abbreviated form, "Simeon, son of Jesus, who is called Ben Sira." Ben Sira is consequently the family name that might be added to the proper name of father and son alike.

The best Greek manuscripts corroborate the statement that Eleazar was the name of the father of Jesus Ben Sira. If the Hebrew text is to be trusted, the authorship is consequently assigned, not to Jesus, but to his son Simeon. One of the editors also maintains that the name of the translator's grandfather was Simeon Ben Sira. But the name 'Jesus' is too closely associated with the book, both in Jewish and Christian tradition—as the superscriptions on the one hand, and the application to the author of the legends of the nativity on the other, show—to permit such an assumption. Another solution suggests itself. Chapters xliv.-l. once formed a separate book. It has been demonstrated that the old Latin version, which Jerome adopted without much emendation, was made by two different men, living in different lands, chapters xliv.-l. not having been translated by the same hand that produced the rest. The unity of this section and its distinct character render it natural that it should have circulated separately. If that is the case, the colophon in l. 27 refers, not to the entire work, but to these chapters. Internal evidence renders it entirely probable that this part was written in the Asmonæan period, by the son of Jesus Ben Sira. The reference to a transfer of the high-priesthood, and the promise of David to the posterity of Phinehas, because of his zeal, in xlv. 23-26, and the description of the high priest Simon in l. 1-24, seem quite decisive. It is natural that the assumption of the pontificate by the Asmonæans should have been in need of scriptural support, and the reward promised to Phinehas for his zeal seems to have furnished the necessary prophecy. Scholars have been divided in regard to the identity of the Simon praised in chapter l. Some have thought of a high priest, Simon the Just, supposed to have lived in the beginning of the third century; others of a Simon who held the office a century later. There is no record showing that either of these men achieved any of the deeds for which Simon is lauded. If Simon the Just really lived in the time of Ptolemy Soter, and if this King's harsh treatment actually included the specific damage presupposed, the high priest may, indeed, have paid attention to the necessary repairs. But Josephus does not seem to have found any mention of this in his sources, since he is able to give no other reason for the title than Simon's piety toward God and kind disposition toward His people. His sources, however, appear to have been late and unreliable. Concerning the Simon who was high priest in the days of Antiochus III., Josephus has no information to give. As evidence of this King's kind feeling toward the Jews, he quotes a letter of his to Ptolemy, in which he tells the Egyptian King, from whom he has just taken Palestine, how generously he is about to reward the inhabitants of Jerusalem for their services in the war. But the letter is manifestly a forgery; and it is significant that Josephus can quote no act, but only a promise, to show the attitude of Antiochus. On the other hand, we know, through I. Macc. xiii. and xiv., that Simon, the Asmonæan high priest, repaired the temple, fortified the holy hill after the capture of the tower, built walls, and strengthened the city against the enemy. The only feature of the description in Eccl. l. not found in this source is the construction of a cistern; but if Simon filled up the hollow between the Akra and the temple north of it, he is quite likely also to have paid attention to the water-supply. There is no reason to doubt the accuracy of the Hebrew colophon. Chapter li. is made up of two parts—verses 1-12 and 13-29. The latter is an acrostic poem, each stichos beginning with a new letter of the alphabet. Between both, the Hebrew text has a long hymn, probably written in the second century A.D. The whole chapter is late. In the part of the book that in the main is the work of Jesus Ben Sira, the clear allusion to the death of Antiochus IV. in x. 9, the reference to Daniel and the whole tenor of the prayer (xxxi. 1-17), and the fact that chapter xliii. does not seem to have been extant in the Hebrew text used by the Syriac translator—apparently point out these sections as later interpolations. Concerning the time when Jesus Ben Sira lived we have no other evidence than the Greek translator's statement that the author was his grandfather. This would render it probable that he wrote his work between B.C. 190 and 170. In his theological views he occupies substantially the position of the later Sadducees. When he meets with angels in a biblical passage he gets rid of them by a rationalistic interpretation. He recognizes no demons. He never hints at any Messianic hope. He is convinced that "the son of man is not immortal." He honors the law, reveres the prophets, but knows as yet no canon of Scripture. He feels that he is himself raised up to be a teacher, even as the holy men of old. His moral philosophy is utilitarian and individualistic. The motive is the happiness that a certain line of conduct will bring. The welfare of others is not presented as a consideration. The author lays down rules rather than principles. He directs how men should act in different situations. His work is not so much a conscious endeavor to find a basis for morality outside of religion, as rather an earnest attempt to commend the righteous life for the happiness it brings to the wisdom-seeking youth of his time.

Bibliography. Cheyne, *Job and Solomon* (London, 1887); Fritzsche, *Die Weisheit Jesus Sirachs* (Leipzig, 1859); Bissell, *The Apocrypha* (New York, 1880); Edersheim, in the *Speaker's Commentary, Apocrypha* (London, 1888); Ryssel, in *Apokryphen des alten Testaments* (Tübingen, 1900); Cowley and Neubauer, *The Original Hebrew of a Portion of Ecclesiasticus* (Oxford, 1897); Schechter and Taylor, *The Wisdom of Ben Sira, Portions of the Book Ecclesiasticus* (Cambridge, 1899); Levi, *L'ecclésiastique ou la sagesse de Jésus, fils de Sira* (Paris, 1898-1901); Schmidt, "Ecclesiasticus," in the *Temple Bible* (London, 1902); Toy, "Ecclesiasticus," in *Encyclopædia Biblica* (London, 1901); Nestle, "Sirach," in *Dictionary of the Bible* (New York, 1902).

ECCLE'SIAZU'SÆ (Lat., from Gk. ἐκκλησιάζουσαι, *ekklēsiazousai*, women in assembly). An inferior comedy by Aristophanes, produced B.C. 392. His subject is an imaginary national assembly of women, held for the establishment of woman's rights, socialism, etc., at Athens. The play is aimed at the attempts to restore the State by means of formal constitutions.

ECCLESIOL'OGY (from Gk. ἐκκλησία, *ekklēsia*, church + Gk. λογία, *logia*, account, from *λέγειν, legein*, to say). (1) That branch of the general science of human society or sociology which deals with so much of human relations as exist for the purpose of religion, embracing the analysis of the Church as organized society, its constructive principles (see POLITY), its relations to the other organizations of society, such as the State, the features of its internal law, and the sphere of its discipline. As constructive principles it considers Episcopacy and Papacy, Presbyterianism, Congregationalism, etc. (qq.v.). (2) The term also connotes that branch of antiquities which deals with the building in which this organized society meets, the church as a structure, and its decoration. It takes note of ecclesiastical architecture, not from the point of view of art history, but from that of its relation to liturgy and ceremonial, iconography, the customs regarding clergy and congregation. It explains the ground plan, elevation, orientation, internal divisions of the church; the form and position of crypt, confessional, altar, lectern and pulpit, choir and choir-screen, seats for clergy, books and vessels for sacred service, priestly robes, paschal candlesticks, reliquaries, crosses, croziers, tabernacles for holy oils, holy-water vase, and other church furniture; it also treats of the baptistery, baptismal font, and chrismatory: of the belfry, its bells, chimes, windows; of the chapels, porches, and other subordinate structures. See CHURCH; BASILICA; CATHEDRAL; TOWER; MONASTIC ART; the separate articles on parts of the church, and on articles of church furniture.

BIBLIOGRAPHY. Rohault de Fleury, *La messe* (Paris, 1883-89), is the fullest systematic study of church furniture; the articles scattered through Smith and Cheetham's *Dictionary of Christian Antiquities* (London, 1877-87) are excellent synopses for the period ending with the early Middle Ages. Durand, a bishop of the thirteenth century, wrote a manual of ecclesiology called *Rationale Divinorum Officiorum* (many editions, and an English translation with an essay by Neale and Webb, "The Symbolism of Churches and Church Ornaments," New York, 1893). Holtzinger, *Altchristliche Architektur* (Stuttgart, 1889), gives the connecting links between liturgy and church architecture and furniture of the early period.

EC'CLESTON, SAMUEL (1801-51). An American Roman Catholic clergyman. He was born in Maryland, and studied at Saint Mary's College, Baltimore, of which he became president in 1829. In 1834 he succeeded Dr. Whitfield as archbishop. Under his auspices the Christian Brothers established a novitiate and training school of their order, parochial schools were multiplied, and several academies for girls were established under the Nuns of the Visitation.

ECDY'SIS. See MOLTING.

ECHEGARAY, ā'chā-gā-rī', JOSÉ (1835—). A Spanish playwright, scientist, and politician, born in Madrid. He received a professorship of mathematics at the school of engineering. He was minister of public instruction in 1873, and minister of finance in 1874 and 1905. In 1874 his play *La esposa del vengador* marked the beginning of a splendid dramatic career for himself, and the opening of a new epoch in the history of the Spanish stage. He has written more than fifty plays, in verse and prose. His tone is one of almost uniform gloom, relieved, however, by the presence of a sane belief in the efficacy of moral law. His principal plays are: *En el puño de la espada* (1875); *O locura ó santidad* (1876); *En el seno de la muerte* (1879); *El gran Galeoto* (1881), treating of the power of slander and considered his best work; *Vida alegre y muerte triste* (1885); *Mariana* (1892); *El hijo de Don Juan* (1892), based on, and identical in theme with, Ibsen's *Ghosts; El estigma* (1895); *Le duda* (1898); *La desequilobrada* (1903); *A fuerza de arrastrarse* (1905). In 1904 he shared with Mistral the Nobel prize for idealism in literature.

ECHELON, ĕsh'e-lŏn (Fr., round of a ladder, from *échelle*, OF. *eschelle*, ladder, from Lat. *scala*, ladder). A military formation. A regiment, when ordered to advance in echelon, would proceed as follows: The leading or named company would advance, followed at company distance by the remaining companies, each marching in a direction perpendicular to its front, so that if the leading company were to halt, the remainder would return to the original line formation. The echelon formation is valuable because of the facility with which "line" may be formed in any direction, front, flank, or rear; it also presents certain obstacles to accurately sighted rifle fire from the enemy.

ECHENEIS, ĕk'ē-nē'ĭs, **ECHENEIDIDÆ**, ĕk'ē-nē-ĭd'ĭ-dē. See REMORA.

ECHENIQUE, ā'chā-nē'kā, JOSÉ RUFINO (1808-79). A Peruvian soldier and statesman, born at Puno. When the army under Gamarra and Bermudez revolted, in 1833, he restored order, and later successively fought in the cause of Santa Cruz and Gamarra. In 1845 he became a member of Castilla's Council. He was elected President of Peru, April 20, 1851, and remained in office until 1855, when repeated revolts against his authority, culminating in his defeat by Castilla, resulted in his banishment from the country. Returning in 1862, he aided in the defense of Callao during the Spanish War of 1866. His candidacy for the Presidency in 1872 was not successful.

ECHEVERRÍA, ā'chā-vĕr-rē'ā, ESTÉBAN (1809-51). A South American poet, born at Buenos Ayres. His education was French, and his early works showed that influence, but he afterwards became more national, and his poem *La cautiva* (1837) contains fine descriptions of the pampas. He was exiled by the Dictator Rosas and went to Montevideo, where he died. His complete works were published at Buenos Ayres in 1870.

ÉCHEVIN, āsh'văN' (OF., Fr. *eschevin*, It. *schiavino*, *scabino*, from ML. *scabinus*, sheriff, from OHG. *skeffino*, Ger. *Schöffe*, from OHG. *scaffan*, Ger. *schaffen*, to create). During the Middle Ages, a royal officer possessing a large measure of power in local administration. The office was common in France and the Low Countries, and prevailed to a less degree throughout Germany. It first appears in the documents of the eighth century. When Charles the Great reformed the administration, the échevins became royal officers for the counties and hundreds. They were named by the *missi* or royal deputies, the counts, and the people, and held their office during good behavior. The system continued without any important change during the Carolingian period. In the tenth century the échevins were given jurisdiction over the non-noble class, the peasants, and the towns, and later became municipal magistrates. At the close of the twelfth century the échevins in the towns were elected yearly. The échevins seem to have formed a body or tribunal which in many cases not only administered justice, but controlled military affairs, and imposed police regulations. In the north of France these tribunals were especially numerous. The powers of the échevins declined after the sixteenth century, and the Central Government, in 1764, sought to unify the whole system of *échevinage* by limiting the number to four for all large towns. In Paris there were four échevins, chosen every two years. Their powers were limited to the regulation of trade, fixing the prices of commodities, and settling the disputes of tradesmen. The office of échevin was abolished in December, 1789, during the first period of the French Revolution.

ECHIDNA, ē-kĭd'nȧ (Lat., Gk. *ἔχιδνα*, viper, from *ἔχις*, *echis*, Skt. *ahi*, Av. *azhi*, serpent). A genus and family (Echidnidæ) of monotreme mammals, the spiny or porcupine ant-eaters of the Australian region, closely allied to the duckbill. The ordinary echidna is from 12 to 18 inches long, and has a broad, depressed body, mounted upon very short, strong legs terminating in big, powerful claws suited to digging into hard ground. The head is small, and the nose prolonged into a slender snout; the mouth is without teeth, but the palate is studded with recurved spines, and the tongue is slender, extensile, and glutinous. The back of the animal is covered with stiff, hedgehog-like spines, mixed with long, coarse hairs; and when danger threatens it outside its burrow, it curls up much like a hedgehog, so as to protect the under parts, which have no spines, but are clothed in silky brown hair. The males have spurs on their heels, like the duckbill (q.v.), but have never been seen to use them. It dwells in burrows of its own digging, and obtains its food by excavating in the hillocks of ants, which it tears open in order to devour the succulent larvæ. Like other monotremes, the echidnas lay eggs, but less is known as to their breeding than in the case of the duckbill. They are gentle in disposition, endure confinement well, eating bread and milk, chopped eggs, etc., and are frequently kept as intelligent and playful pets, exhibiting a good deal of activity and agility. They are inclined to nocturnal habits, and in times of drought become dormant in their burrows.

AUSTRALLIAN SPINY ANT-EATER
(*Echidna aculeata*).

The common echidna (*Echidna aculeata*) seems to be very variable in size, color, and length of spines, and some naturalists have separated the large Tasmanian form as *Echidna setosa*, and the small New Guinea form as *Echidna Lawesii*, but their specific value is doubtful. In New Guinea there also occurs a closely related animal, *Proëchidna* (or *Acanthoglossus*) *Bruijni*, which is somewhat larger, has only three claws on each foot, and its snout and tongue are greatly prolonged. The Papuans call them nodiaks, and hunt them for food in the Arfak Mountains by the aid of dogs which know how to dislodge them from their burrows. Consult: Bennett, *Gatherings of a Naturalist in Australia* (London, 1860); Saville-Kent, *The Naturalist in Australia* (London, 1897). See MONOTREME.

THREE-TOED PAPUAN ANT-EATER
(*Proëchidna Bruijni*).

ECHINADES, ē-kĭn'ȧ-dēz (Lat., Gk. Ἐχινάδες, from *ἐχῖνος*, *echinos*, hedgehog). A group of islands in the Ionian Sea, now known as the Kurzolari Islands. They are situated around the entrance of the Gulf of Corinth, and are supposed to have been formed by drift from the river Achelous. Off these islands was fought the celebrated battle of Lepanto in which Admiral Doria and Don John of Austria overwhelmed the Turkish fleet under Ali Pasha (October 7, 1571).

ECHINIDÆ, ē-kĭn'ĭ-dē. See SEA-URCHIN.

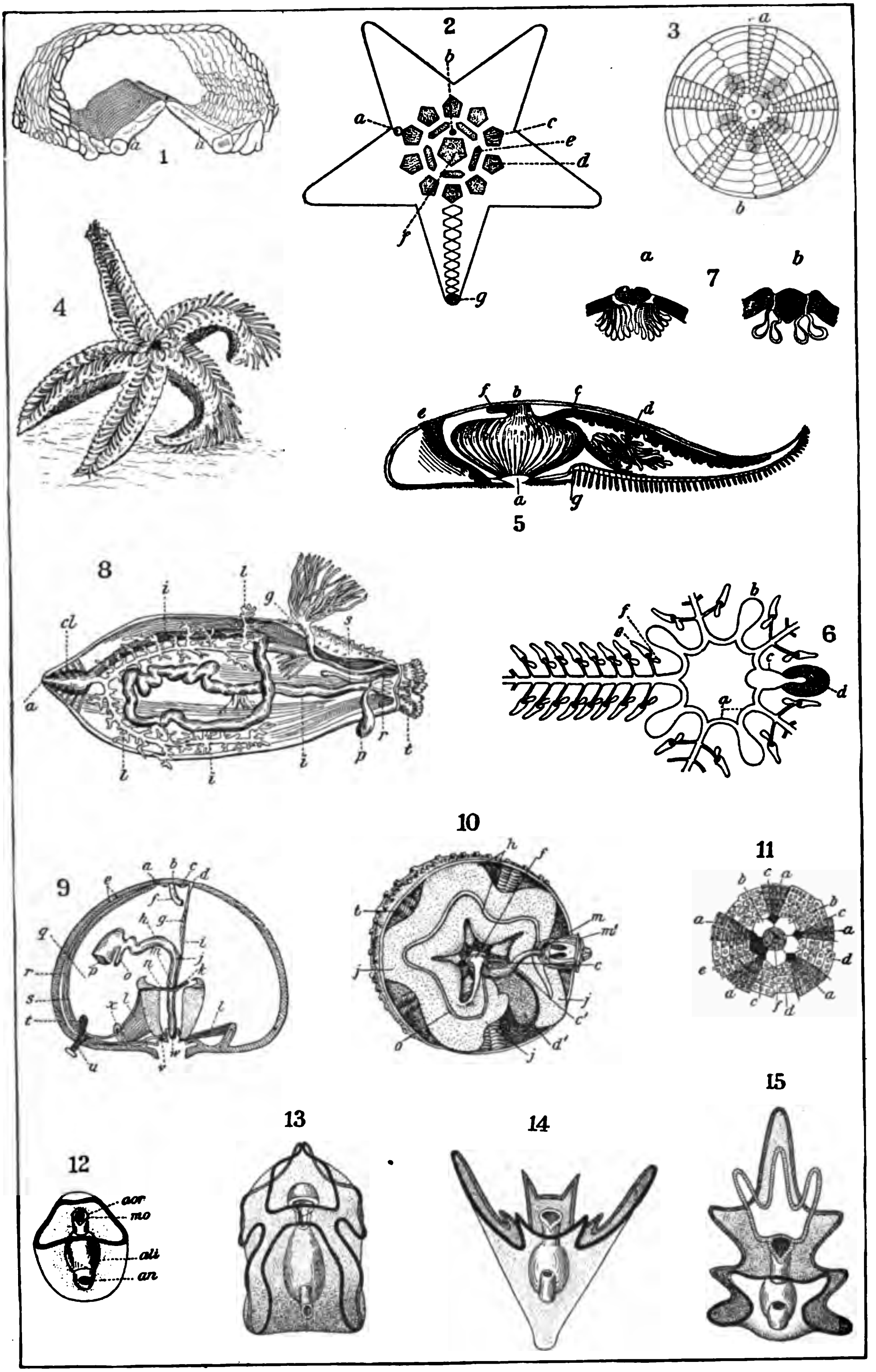
ECHINOCARIS, ē-kī'nō-kā'rĭs (Neo-Lat., from Gk. *ἐχῖνος*, *echinos*, hedgehog + *καρίς*, *karis*, shrimp). A fossil crustacean, the tail-spines of which are common in certain Devonian rocks. See PHYLLOPODA.

ECHINOCOCCUS, ē-kī'nō-kŏk'kŭs. See TAPEWORM.

ECHINODERMATA, ē-kī'nō-dĕr'mȧ-tȧ (Neo-Lat. nom pl., from Gk. *ἐχῖνος*, *echinos*, hedgehog + *δέρμα*, *derma*, skin). One of the great branches or phyla of invertebrate animals, constituting an independent, well-characterized assemblage of organisms. The group is of higher rank than the Cœlenterata, and is lower than the Vermes, with both of which groups it has few features in common. The animals of this phylum do not reproduce by either budding or fission, and therefore they are never found in compact colonies like those formed by the cœlenterates. The body of the animal is built, more or less constantly throughout the phylum, on the pentameral plan of bilateral symmetry, in accordance with which the number five is a dominant feature in the arrangement of the parts.

EXTERNAL COVERING. The external covering of the echinoderms is remarkable for its diversity, for even within the limits of the same family we find a soft, leathery body-wall at one extreme, and a firm, almost immovable 'shell' at the other. This diversity is entirely due to the amount of mineral matter deposited in the body-wall, and the arrangement of the plates formed from it. In the holothurians the body-wall is

ECHINODERMATA



For Names and Descriptions see Text.

chiefly composed of connective tissue, within which are deposited disconnected particles of lime, while in most sea-urchins there is little connective tissue and the carbonate of lime is deposited in firm plates of definite size and shape firmly welded into a hard shell, or 'test,' as it is commonly called. This external covering usually functions quite as much as a skeleton for the attachment of muscles as it does as a 'shell' for protection. The body-wall is often covered with more or less evident knobs, tubercles, or spines, and from the frequency of the latter has arisen the name 'spiny-skinned' animals. These knobs and spines are attached to the plates of the skeleton, either immovably or by a joint which permits of perfect freedom of movement.

VISCERAL ANATOMY. There is well-developed alimentary canal suspended in and distinct from the general body-cavity or cœlome, and provided with both mouth and anus, though the latter may be more or less suppressed in some groups. A combined respiratory and locomotory system of complicated nature, called the water-vascular system, is peculiar to the members of this phylum only. A nervous system, blood-vascular system, and reproductve system are more or less fully developed.

The nervous system is variously modified in the different classes of echinoderms. In all there is a well-developed epidermal system, with circumoral ring and radial branches.

Sense-organs are few and imperfect. We find occasionally pigment eyes, ciliated pits (perhaps olfactory), and positional organs. The sense of touch is well developed. The blood-system is rarely developed, though many forms have an 'axial organ and strands,' the anatomy and physiology of which are still little understood. Special respiratory and excretory organs are found in a few cases.

The water-vascular system, which is present in more or less complete form in all members of the group, consists of a ring vessel about the mouth. From this ring vessel a number of tubes, generally five, radiate to the ambulacral areas, or 'radii.' These tubes connect with the 'tube feet,' or ambulacra, which are extensible sac-like tentacles that project from the surface of the body through pores in the plates of the ambulacral areas. These tube feet function not alone as locomotory organs, but also as respiratory organs, and in some classes they assist in conveying food to the mouth. The circumoral ring vessel has communication with the outside, in most echinoderms, through a tube of variable form, called the stone canal or madreporic canal, which extends from the ring vessel to a special plate, the madreporic plate, on the aboral side of the body. This plate is sieve-like, and through it is sucked the water that fills the water-vascular system. Connected with the ring vessel, in all classes except the Crinoidea, are peculiar bladder-like organs, the Polian vesicles, that serve to regulate the pressure in the radial tubes. Lack of active locomotion obviates the necessity for a well-developed muscular system, although some special muscles of complicated nature are present in connection with particular organs, as the jaws of echinoids.

The mouth of echinoderms is sometimes, especially in the Holothuroidea, surrounded by a crown of tentacles. Usually it is a simple opening, but in the Echinoidea (sea-urchins) it is provided with a complex system of jaws that form the so-called 'Aristotle's lantern.' Outgrowths from the alimentary canal, called 'respiratory trees,' found in the holothurians, and an accessory intestine, attached to the intestine proper in the echinoids, and other modifications of various organs, constitute the respiratory organs; there are no strictly special respiratory organs in the members of this branch.

The sexes are separate, and development takes place through metamorphosis. The egg produces a bilaterally symmetrical free-swimming larva, which differs somewhat in form in the different classes. Three types of larva have been distinguished, and they have received the names auricularia, bipinnaria, and pluteus.

ECOLOGY. About 3000 living echinoderms are known. They are all marine, and the species are scattered through all seas of the globe and are found at all depths, but they are most abundant in the warm seas of the tropics. The only fixed members of the branch are those included in the sub-branch Pelmatozoa, comprising the crinoids, cystoids, and blastoids. Many echinoderms, especially the crinoids, are gregarious, and they are found associated together in vast numbers. Echinoderms are largely benthonic organisms, crawling slowly on the bottom of the sea by means of the tube feet or arms, as in the star-fish and sea-urchins, or by the oral tentacles, as in holothurians. The fixed pelmatozoans are either benthonic, when fixed to the bottom, or pseudo-planktonic, when attached to floating

---

EXPLANATION OF THE PLATE OF ECHINODERMATA.

1. Section of the ray of starfish, showing structure of the skeleton : *a*, *a*, ambulacral ossicles, between which lies the ambulacral vessel in the ambulacral groove. 2. Aboral plates of a starfish : *a*, madreporite ; *b*, anus ; *c*, one of the five basal plates ; *d*, one of the five radials ; *e*, circle of secondary radials ; *f*, dorso-central ; *g*, terminal or ocular plate (compare Plate of CRINOIDS, Fig. 7). 3. Aboral view of a sea-urchin, stripped of epidermis ; *a*, ambulacral plates, in five zones ; *c*, plates of interambulacral zone. 4. Tube feet of a starfish, as used in turning the body over. 5. Section of the disk and arm of a starfish ; *a*, mouth, leading into the wide stomach ; *b*, anus ; *c*, hepatic prolongation of the stomach into the cavity of the arm ; *d*, genital organs ; *e*, madreporic plate (opening of madreporic or stone canal) ; *f*, interradial diverticulum of the rectum ; *g*, ambulacral feet. 6. Diagram of the water-vascular system of a starfish : *a*, oval circular vessel ; *b*, one of the ampullæ or Polian vesicles ; *c*, stone canal ; *d*, madreporic plate ; *e*, one of the series of ambulacral feet connected with the side twigs of the radial canal ; *f*, one of the ampullæ of the same. 7. transverse sections of the ambulacral fields of two blastoids, showing forms of hydrospires : *a*, Orophocrinus ; *b*, Granatocrinus. 8. Anatomy of a holothurian : *t*, tentacles ; *r*, calcareous ring at the base of the tentacles ; *p*, Polian vesicle ; *s*, sand canal ; *i*, *i*, *i*, alimentary canal ; *g*, duct of the reproductive organs ; *cl*, cloaca ; *a*, anus ; *l*, *l*, respiratory tree. 9. Vertical section of an echinoid (sea-urchin) : *a*, ocular plate ; *b*, anus ; *c*, aboral ring blood-vessel ; *d*, madreporite ; *e*, radial extension of the stomach, surrounding the radial nerve ; *f*, rectum ; *g*, ovoid gland ; *h*, intestinal blood-vessel ; *i*, stone canal ; *j*, alimentary canal ; *k*, Polian vesicle ; *l*, *l*, muscles passing from the auricles to Aristotle's lantern ; *m*, oral ring blood-vessel ; *n*, radial ambulacral vessel ; *o*, siphon ; *p*, intestine ; *q*, cœlome ; *r*, radial nerve ; *s*, radial ambulacral vessel ; *t*, ampullæ ; *u*, ambulacral feet ; *v*, radial nerve ; *w*, mouth ; *x*, auricle. 10. Horizontal section of a sea-urchin, showing organs (letters as in Fig. 9) ; also, *c*, œsophagus ; *d′*, ovary ; *m′*, Aristotle's lantern. 11. Apical system of plates and aboral extremities of zones of the shell of a sea-urchin : *a*, ambulacral zones ; *b*, genital plates ; *c*, (black) ocular plates ; *d*, interambulacral zones ; *e*, madreporite ; *f*, periproct. 12–15 Diagrams of the development of the larvæ of echinoderms ; 12, primitive form ; 13, avicularia (holothurians) ; 14, a pluteus (sea-urchins and brittlestars) ; 15, a bipinnaria (starfishes).

wood, and the free-swimming crinoids almost fall among the pelagic animals or plankton.

CLASSIFICATION. The Echinodermata are divided among the following seven classes: Holothuroidea, Echinoidea, Asteroidea, Ophiuroidea, Crinoidea, Cystoidea, and Blastoidea. The last three groups, comprising mostly attached forms, are often included as subclasses under a class Pelmatozoa. We prefer to associate the first four in a sub-branch Eleutherozoa, and the last three in a second sub-branch, Pelmatozoa. The characters of the various classes are as follows:

I. HOLOTHUROIDEA (holothurians, or sea-cucumbers). The body is cylindrical or worm-like, and has a soft, leathery skin, in which are imbedded minute calcareous spicules or plates. A certain degree of bilateral symmetry is apparent, but there is little trace of radial pentameral symmetry. The mouth is at the anterior end of the body and is surrounded by tentacles; the anus is at the posterior end. The only portions of holothurians that are apt to be preserved as fossils are the calcareous bodies of the skin. These are known in rocks of Carboniferous to recent time, but they are never common. See HOLOTHURIAN.

II. ECHINOIDEA (sea-urchins). In this group the body is inclosed in a more or less rigid box of polygonal stony plates, arranged in rows that form five ambulacral and five interambulacral areas. In the more regular, radial forms both the mouth and the anus are central on opposite surfaces of the body. In other irregular forms, exhibiting less radial and greater bilateral symmetry, the mouth may be placed toward the anterior end and the anus is variously situated, either on the dorsal, lateral, or ventral surface, but always in the middle line. The majority of echinoids have complicated jaws. About 300 living and 2500 fossil species are known. The earliest appear in Ordovician rocks. See ECHINOIDEA; SEA-URCHIN.

III. ASTEROIDEA (starfish). The body of the animals of this class are flattened dorso-ventrally, and the ambulacra are produced into five (or some multiple of five) radiating arms. The arms are not at all demarcated from the central portion of the body, and they contain prolongations of the cœlome and of most of the organs. Radial symmetry is quite marked. The tough skin contains calcareous plates of irregular form that are not united to each other, so that the body-wall is to some extent flexible. The ambulacral plates occupy the larger portion of the under sides of the arms, and the tube feet are well developed. The large mouth-opening is in the centre of the ventral surface of the disk, and the small anal opening is near the centre of the dorsal surface, except in a few genera, where it is wanting, and the intestine is then closed. The earliest starfish appear in rocks of Ordovician age, and they have continued, though never becoming abundant, through all subsequent periods down to the present time. See STARFISH.

IV. OPHIUROIDEA (brittlestars). The animals of this group have the body flattened in the same manner as in the Asteroidea, with the ambulacral arms produced into five long rays that are either simple or many times branched. The body is covered by stony plates that present a greater degree of systematic arrangement than is seen in the Asteroidea, and they are more firmly united. The central disk is well demarcated from the arms, and no portions of the cœlomic cavity or diverticula of the alimentary canal or genital system are prolonged into them. The arms serve for locomotion. The mouth is central on the ventral surface and the anus is closed. The class makes its first appearance in Silurian rocks, and it is represented, though rarely, in rocks of all later periods. At present its members are widely distributed. See OPHIUROIDEA; BASKETFISH; BRITTLESTAR.

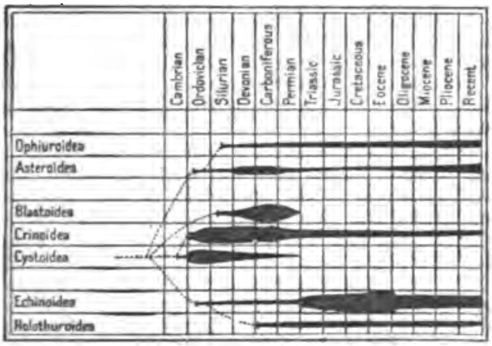
The sub-branch Pelmatozoa, including the Crinoidea, Cystoidea, and Blastoidea, constitutes a group of mostly attached echinoderms in which the body is inclosed in a somewhat cup-shaped, spherical, or sac-like box of calcareous plates, and is raised, during at least a portion of the life of the individual, upon a stalk with the ventral surface and mouth upward.

V. CRINOIDEA (sea-lilies). These are pelmatozoans in which the cup-shaped body-wall is made up of closely joined plates arranged according to definite plans of pentameral radial symmetry, the arrangement varying in every family according to the number of plates in the 'calyx' or body-cup. The calyx bears five simple or branched, highly flexible arms, that are provided with pinnules to screen food from the water. The mouth is at the middle of the upper or ventral surface, and the anus is excentric. Both these orifices undergo peculiar and important modifications that are used in classifying the members of the group. The class appeared in Ordovician time, and was exceedingly abundant during the Paleozoic era. About 2000 fossil species, in 175 genera, and 600 living species are known. See CRINOIDEA.

VI. CYSTOIDEA. Pelmatozoans with spherical or sac-like body inclosed in a more or less irregular box, composed of more or less closely united polygonal plates that present definite plans of arrangement only in the most advanced forms. The animals were sessile, stalked, or free. The arms are poorly developed, and in some forms are not separated from the oral surface of the body, in which case they appear as ambulacral grooves radiating from the mouth. The mouth is central, and the anus is always excentric and is placed either on the oral or aboral surface. In some forms the mouth is slightly excentric. The earlier and more primitive members of the class are spherical with the plates very irregular. There are some genera which exhibit tendencies toward the crinoid type, others resemble the blastoids, or the echinoids or starfish. On this account the cystoids have by some authors been considered to resemble, more nearly than any other class, if not actually to represent, the original primitive echinoderm stock from which was derived through evolution all the other classes. Cystoids appear in the rocks of Upper Cambrian age, being the earliest group of echinoderms, and they reached a considerable expansion in the Ordovician and Silurian periods. They disappeared at the close of the Paleozoic. See CYSTOIDEA.

VII. BLASTOIDEA (Pentremites). This is a small extinct, specialized group of echinoderms, derived from the cystoids at perhaps an early Ordovician date, that did not reach its maximum development until Carboniferous time. Then, however, after the cystoids had quite disappeared, and the crinoids had begun to decline, this group attained considerable prominence, so that its members are characteristic index fossils of the Carboniferous and Permian rocks. The class became extinct at the close of the Paleozoic. The body is inclosed in a bud-formed box made up generally of thirteen plates of regular form and strictly pentameral radial arrangement. The mouth is at the summit of the calyx, and the anus at the side. There are no arms, and the relatively large ambulacral areas extend downward over the surface of the calyx, sometimes nearly to the base or stem. The stem was short or absent. About 20 genera and 150 species are known. See Pentremites.

For description of the ontogeny or development of the echinoderms, consult the works by Lang and Bather mentioned in the bibliography. The following diagram is intended to represent both the geological distribution and the phylogenetic relationships of the various classes:



Bibliography. For general treatises on both living and fossil forms, see Bather, "The Echinoderma," in Lankester's *Treatise on Zoölogy*, part ii. (London, 1900); this contains a good bibliography. Consult, also: Parker and Haswell, *Textbook of Zoölogy*, vol. i. (London and New York, 1897); Lang and Bernard, *Text-Book of Comparative Anatomy*, part ii. (London and New York, 1896), also with a bibliography. These last two works are technical. Zittel and Eastman, *Text-Book of Paleontology*, vol. i. (London and New York, 1900), deals almost entirely with the fossil forms. See, also, Alexander Agassiz, "Paleontological and Embryological Development," *Proceedings of the American Association for the Advancement of Science, Boston Meeting* (Cambridge, 1880); Carpenter, "Notes on Echinoderm Morphology," *Quarterly Journal of the Microscopical Society*, new series, vols. xviii.-xxviii. (London, 1878-87); Bell, "On the Arrangements and Interrelations of the Classes of the Echinodermata," *Annals and Magazine of Natural History*, series vi., vol. vii. (London, 1891); Ludwig, *Morphologische Studien an Echinodermen* (Leipzig, 1877-82); Neumayr, *Die Stämme des Thierreiches* (Vienna and Prague, 1889). See, also, the works cited under the articles on various classes of echinoderms above referred to.

ECHINOIDEA, ĕk′ĭ-noi′dē-ȧ (Neo-Lat. nom. pl., from Gk. *ἐχῖνος*, *echinos*, hedgehog + *εἶδος*, *eidos*, form). One of the five classes of Echinodermata (q.v.), containing the sea-urchins and their kindred. It is subdivided into four orders: (1) Palæo-Echinoidea, all fossil; (2) Regularia, the typical globular echinoids or sea-urchins; (3) Clypeastridea, the flattened cake-urchins and sand-dollars; (4) Spatangoidea, the cordate heart-urchins. For further details of existing forms, see Sea-Urchin.

ECHIUM, ĕk′ĭ-ŭm. See Viper's Bugloss.

ECHIURIDA, ĕk′ĭ-ū′rĭ-dȧ. An order of annelids. See Annulata.

ECHMIADZIN, ĕch′mē-ȧd-zēn′. See Etchmiadzin.

ECHO (Lat., from Gk. Ἠχώ, from ἦχος, *ēchos*, sound). A personification in Greek mythology. According to the legend, the nymph Echo, by her talking, detained Hera when searching for Zeus among the mountain nymphs. As a punishment the goddess deprived her of the power of speech unless first spoken to, when she was compelled to reply. The love of Pan for Echo was also celebrated by later poets. According to Ovid, the nymph Echo, having conceived a hopeless passion for Narcissus, pined away until only her voice remained. A portico at Olympia, where there was a seven-fold echo, was called by the nymph's name.

ECHO. Sound is produced by longitudinal waves or vibrations of the air or other medium through which it travels, and these waves on striking a surface are reflected according to the laws of reflection. A sound thus reflected is termed an echo, and the rule that the angle of incidence must equal the angle of reflection holds good, as in the case of light and other forms of wave-motion. If the sound is reflected by an obstacle at right angles to the direction of propagation, the echo returns to an observer at the place where the sound originated. This phenomenon enables one to ascertain the distance to a cliff or other surface from which an echo is obtained, and is made use of by navigators when approaching, in a fog, a shore with cliffs. Knowing that sound at ordinary temperatures travels with an approximate velocity of 1125 feet per second, by multiplying this figure by the time between the sound—that of a steam whistle for example—and the perception of the echo, we obtain the distance to the cliff and back. Reflection also takes place from the surface of a cloud, as is the case with thunder, and an uneven surface such as that presented from the edge of a wood, which often will furnish excellent echoes.

ECHO, in Music. (1) A subdued repetition of a phrase. (2) In large organs there is a separate set of pipes, placed at a distance, so as to produce the effect of an echo. There are separate stops and generally also a special manual.

ECHO CAÑON. A long and deep gorge in northern Utah, on the Union Pacific Railroad (Map: Utah, B 1). It is about 25 miles northeast of Salt Lake, and is remarkable for its echoes and sublime scenery. The sides of the cañon are of bare rock and almost vertical. Owing to erosion, many of the rocks have assumed curious shapes.

ECHTER, ĕk′tẽr, Michael (1812-79). A German painter. He was born in Munich, received his artistic training at the academy there, and assisted Julius Schnorr von Karolsfeld (q.v.) in the decoration of the *salle des fêtes* of the royal palace at Munich with nineteen wall paintings derived from the history of Rudolph of Hapsburg, Charlemagne, and Frederick Barbarossa. With Kaulbach (q.v.) he restored certain mural works in the Berlin Museum, and subsequently he established himself in Munich, where he executed several important commissions, including decorative paintings in the Bavarian National Museum, and "The Battle on the Lechfeld," a large canvas to form one in a series of thirty historical pictures in the Maximilianeum. He also painted scenes from Wagnerian opera for King Louis II. of Bavaria. In 1868 he was appointed a professor in the Munich School of Industrial Arts.

ECHTERMEYER, ĕK′tĕr-mī′ĕr, Ernst Theodor (1805-44). A German critic and compiler, born at Liebenwerda. His *Auswahl deutscher Gedichte* (1837; 33d ed. 1900) has been widely circulated in Germany.

ECHTERNACH, ĕK′tĕr-näG. A town in the Grand Duchy of Luxemburg, situated amid beautiful scenery on the Sure, 18 miles northeast of Luxemburg. It is celebrated for its Benedictine abbey, founded in 698, which retained its autonomy until 1801. The Romanesque abbey church of Saint Willibrod, dating from 1017, has been restored, and is noted for its archæological features. The Dingstuhl, or Rathaus, and the Casino Garden are also noteworthy. Boat-building is one of the chief industries. The "Dancing Procession," peculiar to Echternach, in which from twelve to fifteen thousand persons from the surrounding region take part annually on each Whit-Tuesday, dates from the eighth century, when the intercession of Saint Willibrod was invoked against a species of shaking fit which afflicted the local cattle. Population, in 1900, 3538.

ECHTER VON MESPELBRONN, fôn mĕs′pĕl-brôn. See Julius, Echter von Mespelbronn.

ECHTLER, ĕKt′lĕr, Adolf (1843—). A German genre painter, born in Danzig. He first studied at the Academy of Venice, under Karl Blaas; then in Vienna, under Führich; and in Munich, under Wilhelm Diez. From 1877 to 1888 he lived in Paris, after which he settled in Munich. Great vividness, powerful characterization, often with a fine touch of humor, and masterly execution, distinguish his numerous episodes from popular life in Italy, Brittany, and Normandy, among which "The Gamblers" (1883), in the Dresden Gallery, is one of the best. Another good specimen is "A Cropper," in the New Pinakothek at Munich.

ECHU′CA (formerly Hopwood's Ferry). A town and river port of Victoria, Australia, on a peninsula formed by the Murray and Campaspe rivers, 157 miles north of Melbourne (Map: Victoria, D 3). A roadway and railway bridge, 1905 feet long, of the Murray River Railway, connects Echuca with Moama, on the New South Wales side of the Murray River. It has important vineyards and wine factories, and a considerable river trade in wool, wine, and red-gum timber. Population, in 1901, 4097.

ECIJA, ā′thė-Hȧ. A city in the Province of Seville, Spain, 47 miles east by north of the city of Seville, on the river Genil, at the head of navigation, and on the Cordova-Cadiz Railway (Map: Spain, C 4). It is well built, the streets and plazas being clean and paved, and has handsome gardens. A fine promenade extends along the river, and in the Plaza Mayor stands the municipal building, one of the notable structures of the city. The Plaza de Toros, well known as the scene of some of the most exciting bull-fights in Spain, occupies the site of the Roman amphitheatre. Ecija contains hospitals, asylums for orphans and the aged, barracks, and a large theatre. A long and narrow stone bridge spans the Genil at this point. The climate is excessively hot. The city is the centre of a productive agricultural section, and has important manufactures. Its foot-wear is known throughout Spain, and there are several woolen, linen, and silk mills, flour-mills, and tanneries. Population, in 1901, 23,128. Ecija is an ancient city, some ascribing its origin to the Greeks long before the rise of the Romans. Anciently known as *Astigi*, it was named *Colonia Julia Augusta Firma* by the Romans, under whom it ranked in importance with Cordova and Seville. It occupied a prominent place as a border town in the struggle between the Moors and Christians. There are still extant Roman remains, and several gates and towers representative of Moorish architecture.

ECK, Ernst Wilhelm Eberhard (1838-1901). A German jurist. He was born in Berlin, and was educated at the university of that city and at Heidelberg. He held professorships at Berlin (1871), Giessen (1872), Halle (1873-77), Breslau (1877-81), and Berlin (after 1881). His principal works include: *Die sogenannten doppelseitigen Klagen des römischen und gemeinen deutschen Rechts* (1870; *Die Verpflichtung des Verkäufers zur Gewährung des Eigentums nach römischem und gemeinem deutschen Recht* (1874); "Die Stellung des Erben," etc., in Bekker and Fischer, *Beiträge zur Beurteilung des Entwurfs eines bürgerlichen Gesetzbuchs* (1890), a work written apropos of the projected new civil code of Germany.

ECK, Heinrich (1837—). A German geologist. He was born at Gleiwitz, Silesia, and was educated at Breslau. After participating in the Prussian geological survey in Thuringia and Silesia, in 1862, he was appointed lecturer at the mining school in Berlin in 1866, and professor of mineralogy and geology at the Polytechnic Institute, Stuttgart, in 1871. His investigations are devoted principally to the Triassic deposits, and are discussed in numerous writings which appeared in the publications of the German Geological Society. His larger works include: *Ueber die Formationen des bunten Sandsteins und des Muschelkalks in Oberschlesien und ihre Versteinerungen* (1865); "Rüdersdorf und Umgegend," in *Abhandlungen zur geologischen Spezialkarte von Preussen*, i. (1872).

ECK, Johann Maier von (1486-1543). A German theologian, the well-known adversary of Luther and opponent of the Reformation. He was born at Eck (now Egg), Suabia, November 13, 1486. He studied at Heidelberg (1498), Tübingen (1499), and Freiburg (1501). He became doctor of theology at Freiburg in 1510, and professor of theology at Ingolstadt in the same year. In 1512 he became chancellor of the university and canon of Eichstädt, and held these positions the rest of his life. In 1518 he wrote the *Obelisci*, in opposition to Luther's theses. Previously he had been on friendly terms with the reformer. Carlstadt (q.v.) and Luther wrote replies to this work, and in 1519 occurred the memorable disputation at Leipzig, lasting from June 27th to July 16th. In 1520 he visited Rome and urged upon the Pope, Leo X., to take strong measures against Luther. The Pope consented, and Eck returned with a Papal bull of condemnation in his pocket. From this time on he was prominent among the opponents of the Reformation in Germany and Switzerland. In 1525 he visited England, and was well received by Henry VIII. He disputed at Baden, Switzerland, in 1527, with Haller of Bern and Œcolampadius of Basel, and attended the Augsburg Diet in 1530. He also took part in the religious convocations held at Worms in 1540 and at Regensburg in 1543. He died at Ingolstadt, February 10, 1543. His most important works are included in *Operum Johannis Eccii contra Lutherum* (Augsburg, 1530-35). He prepared a German translation of the Old Testament, and revised Luther's translation of the New. Consult Wiedemann, *Dr. Johannes Eok* (Regensburg, 1865).

ECKARDT, ĕk'ärt, Julius von (1836—). A Russo-German author and diplomat. He was born at Wolmar (Livonia); was educated at the universities of Saint Petersburg, Dorpat, and Berlin, and with Bärens published the *Rigasche Zeitung*, a journal which served as the chief exponent of the principles of the German Constitutional Party in the governments of Esthonia, Livonia, and Courland. In 1867 he became a resident of Germany, where he was associated with Gustav Freytag, the well-known novelist, at Leipzig, in the publication of the *Grenzboten* newspaper from 1867 to 1870. In 1884 he was appointed a Privy Councilor of Prussia, and from 1885 was German consul successively at Tunis, Marseilles, Stockholm, Basel, and Zurich. His publications include *Die Baltischen Provinzen Russlands* (2d ed., 1869) and *Jungrussisch und Altlivländisch* (2d ed., 1871). Many anonymous works on Russian affairs are also ascribed to him.

ECK'ELS, James Herron (1858—). An American banker and financial expert, born at Princeton, Ill. He graduated at the Albany Law School (New York) in 1880, and practiced law at Ottawa, Ill., from 1881 to 1893. From 1893 to 1898 he was United States Comptroller of the Currency, and in the Presidential campaign of 1896 was a prominent Gold-Standard Democrat. He became president of the Commercial National Bank of Chicago in 1898.

ECK'ER, Alexander (1816-87). A German anatomist and anthropologist. He was born at Freiburg, and was educated at the university in that city and at Heidelberg and Vienna. He was professor of anatomy and physiology at Basel from 1844 to 1850, when he was called in the same capacity to Freiburg, where he formed a valuable anthropological collection. The Museum of Ethnology at Freiburg was also established by him. He was co-editor of the *Archiv für Anthropologie*, and wrote the following important publications: *Erläuterungstafeln zur Physiologie und Entwicklungsgeschichte* (1850-59); *Crania Germaniæ*, with 38 plates (1863-65); *Die Hirnwindungen des Menschen* (1869); *Die Anatomie des Frosches, ein Handbuch für Physiologen, Aerzte und Studierende* (3 parts, 1864-82; part 1, 3d ed., 1896).

ECKERMANN, ĕk'ĕr-mȧn, Johann Peter (1792-1854). A German author and editor of Goethe's *Works*, born at Winsen. He served in the War of Liberation (1813-14), and afterwards studied at Hanover and Göttingen. In 1822 he sent Goethe the manuscript of his *Beiträge zur Poesie*. Goethe was favorably impressed with the work, and in the following year Eckermann went to Weimar and became Goethe's private secretary. He held several minor public offices in the grand duchy after Goethe's death, but is memorable solely for his *Gespräche mit Goethe* (1836-48), a translation of parts 1 and 2 of which, by Margaret Fuller, appeared in Boston in 1839, and a complete one by Oxenford in London (1850). There are translations in almost every European language, even Turkish. Eckermann published Goethe's *Nachgelassene Werke* (1832-33), and coöperated with Riemer in the edition of the *Sämtliche Werke*, in forty volumes (1839-40).

ECKERNFÖRDE, ĕk'ĕrn-fĕr'de. A town in the Province of Schleswig-Holstein, Prussia, Germany, on the Baltic, 20 miles northwest of Kiel by rail. It stands on a strip of land dividing Eckernförde Bay into two portions, and has a fine harbor. It is the headquarters of the Prussian fisheries, and carries on a thriving trade in agricultural produce, salt, hardware, and tobacco. Its public institutions include a teachers' college and a school of architecture. Population, in 1900, 6719.

ECKERSBERG, ĕk'ĕrs-bĕrk, Johan Fredrik (1822-70). A Norwegian landscape painter. He was born at Drammen and studied at Düsseldorf. He founded an important school at Christiania, Norway, in 1859. Among his works are "Sunrise in the High Mountains," a series of views of Madeira, and "A View in Saeter Valley," in the Christiania Gallery.

ECKERSBERG, Kristoffer Vilhelm (1783-1853). A Danish painter, born at Varnaes, Schleswig. He studied in Copenhagen, Italy, and Paris, and upon his return to Denmark was made professor at the Academy of Copenhagen. His first work of importance was "Moses Dividing the Waters of the Red Sea" (1817). Others are the "Women at the Grave of Christ" and the "Death of Balder." Besides his historical pictures, treating episodes of Danish history, he painted marines, and good portraits of Thorwaldsen and the royal family of Denmark.

ECKERT, ĕk'ĕrt, Karl Anton Florian (1820-79). A German musician, born at Potsdam. He studied under a number of prominent teachers, among them, H. Ries, Rungenhagen, and Mendelssohn, and early gave evidences of talent as a composer. After having been accompanist at the Théâtre Italien, he became its conductor in 1852, and the same year went to the United States with Henriette Sontag. He was kapellmeister at the Court Opera, Vienna (1853); at Stuttgart (1860); and at Berlin (1869). His early compositions were pretentious and unsuccessful, but his songs are still popular.

ECK'ERT, Thomas Thompson (1825—). An American telegrapher and manager of telegraph systems, born in Saint Clairsville, Ohio. He superintended the military telegraph office at General McClellan's headquarters in 1861, and held a similar position with the Army of the Potomac during the Peninsular campaign. In 1862 he organized the military telegraph service in the War Department buildings in Washington. At the close of the war he received the brevet rank of brigadier-general, and from 1864 to 1866 was Assistant Secretary of War. He was superintendent of the eastern division of the Western Union Telegraph Company from 1866 to 1875, and was president of the Atlantic and Pacific Telegraph Company from 1875 to 1880, and of the American Union Telegraph Company from 1880 to 1881. On the consolidation of these two corporations with the Western Union, in 1881, he was elected vice-president and general manager of the latter, in 1892 became president and manager, and retired early in 1902.

ECK'FORD, Henry (1775-1832). An American naval architect. He was born in Irvine, Scotland, and when sixteen years old became a shipwright in the shipyards of his uncle, John Black, at Quebec. In 1796 he removed to New York and established a shipyard of his own. During the War of 1812 he constructed a fleet of ships of war upon Lake Erie in a remarkably short period of time. He was the builder of the *Robert Fulton*, which made the first successful ocean trip ever made by a steamship, from New York to New Orleans and Havana. In 1820 he was appointed naval constructor in charge of the Brooklyn Navy Yard, where he designed and superintended the construction of six ships of war. Leaving the service of the Government, he engaged again in ship-building on his own account, and constructed vessels for several European and South American countries. In 1831 he built a frigate for the Sultan of Turkey, and accompanied it to Constantinople, where the Sultan offered him the position of chief constructor in his navy. While engaged on plans for some new ships, he died at Constantinople in the following year.

ECKHARDT, ĕk'härt, or **ECKART,** The Trusty (Ger. *der getreue Eckart*). In German legend, an old man whose doom it is to precede the spectral band of Frau Holle ("Die wilde Jagd"), in their wild ride through the country, and to warn all whom he meets, but especially children, of their approaching danger. He is depicted with a flowing beard and a white staff, and is familiar through Goethe's poem of the same title. According to another version Eckhardt sits at the entrance to the Venusberg, to dissuade those who would enter, and often attends the goddess on her journeys. There are several variations of the legend.

ECK'HART, Johann Georg von (1664-1730). A German historian, born at Duingen. He studied at Leipzig, in 1694 became an assistant to Leibnitz in the latter's historical studies, and in 1706 professor of history at Helmstedt. Elevated to the nobility, he was in 1724 appointed librarian at the court of the prince-bishop of Würzburg. Among his works are the *Corpus Historicum Medii Ævi* (1723) and the *Commentarii de Rebus Franciæ Orientalis et Episcopatus Wirceburgensis* (1729), long-standing authorities on the times of which they treat.

ECKHART, or **ECKARDT,** Johannes (c. 1260-1327). A noted German mystic, generally called Meister (Master) Eckhart. He was of the Dominican Order, and in 1298 became prior at Erfurt and Vicar of Thuringia. In 1303 he was made provincial of his Order for Saxony, and in 1307 Vicar-General of Bohemia. For several years he lectured at Paris. He was distinguished for practical reforms and for his power as a preacher. He systematized and expounded the fundamental notions of the Beghards (see Beguines) and Brethren of the Free Spirit. The opponents of the Beghards found some propositions in Eckhart's works for which he was called to account by the Inquisition at Cologne in 1327. He made a recantation and appealed to the Pope, by whom some of his propositions were formally condemned. Probably before the issuing of this condemnation Eckhart died. His works show that he was deeply learned in all the philosophy of the time, and a profound thinker. His style is without system, brief, mystical, and full of symbolical expressions; but his thinking was clear, calm, and logical, and he gave the most complete exposition of what may be called Christian pantheism. The starting-point of his doctrine is that, apart from God, there is no real being. But, in his view, God is the unknown. He conceives of the Godhead as without anything that can be affirmed concerning it. Anything definitely ascribed to it would limit and therefore destroy its infinity. The Godhead is not God as known to us. From it proceeds the triune God, who is known. The *essence* of the Godhead is what it is in itself; its *nature* is that which it becomes as an object for others. It reveals itself in the personal God, the Father. The Son is the word or expression through and in which the Father becomes self-conscious. The Father eternally begets the Son, and the Son's return into the Father in love and mutual will is the Spirit. The Father is not before the Son; only through the begetting of the Son, only through arriving at self-consciousness, does He become the Father. The genesis of the Son from the Father involves also the production of the world of things; for God is reason, and in reason is contained the ideal world of creatures. In the Son all things are made in ideal form. As all things have arisen from God, so they all tend to return to Him. Repose in Him is the end of all things; and in man, the noblest of creatures, this end is realized. In him, specially, there is the power of reaching to the absolute, the ground both of God and the universe. This power—which Eckhart called *the spark*—is in truth God working in man. In cognition of God, God and man are one; there is no distinction of knower and known. Union with God—the birth of the Son in the soul—is the ultimate end of activity, and is to be attained by resigning all individuality. When this is reached the soul is one with God; its will is God's; it cannot sin. Yet all this applies only to the 'spark' in the soul, the other powers of which may be properly employed about other things. Thus, the way is left open to adjust the balance between feeling and action, between philosophical theory and practical life. Consult: Pfeiffer, "Meister Eckart," second volume of *Deutsche Mystiker* (Leipzig, 1857), containing a rich selection from his writings; Martensen, *Meister Eckhart* (Hamburg, 1842); Preger, *Geschichte der deutschen Mystik im Mittelalter* (Leipzig, 1874).

ECKHEL, ĕk'el, Joseph Hilarius (1737-98). An eminent Austrian numismatist, born at Enzersfeld. He was educated at the Jesuits' College in Vienna, and in 1751 entered the society. His knowledge of numismatics soon won him the place of keeper of coins and medals in the college. In 1772 he went to Italy, where for two years he was engaged in the study of coins, and on his return to Vienna he was made director of the Imperial Cabinet of Medals and professor of archæology at the university. Beginning with 1775, he published numerous works on coins and gems, but his greatest work is his *Doctrina Numorum Veterum* (8 vols., 1792-98). A supplement was added in 1826 from papers left by Eckhel at his death; this volume also contains an account of his life and writings. By his great work Eckhel became the founder of scientific numismatics.

ECKHOF, ĕk′hôf, KONRAD. See EKHOF.

ECKMÜHL, ĕk′mụl, or **EGGMÜHL**. A village of Bavaria, on the Grosse Laber, 13 miles south-southeast of Ratisbon, noted for the battle fought there on April 22, 1809, between 75,000 French and 40,000 Austrians. The Austrian Archduke Charles had taken up his position on the right bank of the Danube, near Ratisbon. From this point, at the head of four divisions of the Austrian Army, he threatened the French position at Donauwörth. Davout, however, succeeded in keeping him in check, while Napoleon, swinging round to the southeast, interposed himself between the road to Vienna and the Austrian Army, with which he came face to face at Eckmühl. The action on the side of the French was commenced by Lannes, who drove back the Austrian left, while at the same time the village of Eckmühl was stormed by the Württembergers. Shortly afterwards the high grounds between Eckmühl and Laichling, also occupied by the Austrians, were abandoned after an heroic struggle, and the Archduke ordered a retreat on Ratisbon, which was admirably executed, though at the sacrifice of the entire Austrian cavalry, who were cut to pieces at Eylofstein while covering the movement. The Austrians lost nearly 30,000 men at Eckmühl and in the two days' fighting that preceded it. The French loss was much less.

ECKSTEIN, ĕk′stīn, ERNST (1845-1900). A versatile German humorist, poet, and novelist, born at Giessen. His first literary work, *Schach der Königin* (1870), and *Pariser Silhouetten* (1873), was done in France, as were the grotesque *Die Gespenster von Varzin* (1870), and *Der Stumme von Sevilla* (1871). His travels in Italy and Spain resulted in the stories *Margherita; Am Grabmal des Cestius;* and *Die Moschee von Cordova*. He returned to Germany, lived for several years in Leipzig as editor of a literary journal and of a comic weekly, and wrote many brilliantly humorous sketches, of which *Der Besuch im Carcer* is typical. In 1885 he moved to Dresden, and afterwards wrote several serious novels of classical life, among which *Die Claudier* (1882), *Prusias* (1883), *Aphrodite* (1886), *Pia* (1887), and *Nero* (1889) are noteworthy.

ECLECTICISM (from *eclectic*, from Gk. ἐκλεκτικός, *eklektikos*, selecting, from ἐκλέγειν, *eklegein*, to select, from ἐκ, *ek*, out + λέγειν, *legein*, to gather). In philosophy, an attempt to piece together from various competing systems such elements as may, to superficial view, appear fairly compatible. The prevailing motive is usually practical, being a desire to get a set of opinions which shall lend their support to moral and religious life. Eclecticism appears wherever great speculative power is wanting at the same time that the conflict between traditional schools is vigorously carried on without much appreciation of the reach of the principles involved. Under such conditions many thinkers prefer to keep out of the strife of the schools, and endeavor to satisfy their not very exacting intellectual demands by selecting here and there what appears to go together to form a satisfactory intellectual foundation for the needs of this life. In ancient philosophy, Cicero was the most conspicuous if not the greatest representative of this tendency, adopting elements from the Skeptic, the Stoic, and the Peripatetic schools without obtaining any systematic outcome from this combination. From his day to this, eclectics have been numerous. Cousin (q.v.) is often called the great modern eclectic, but perhaps this characterization fails to do justice to his desire to get a consistent system rather than a merely edifying one. Every great philosopher gathers his materials wherever he finds them. He is not troubled by the fact that he finds them in mutually hostile territories. But what distinguishes him from the eclectic is his desire to know what is true rather than to believe what is helpful, and above all his ability to weave his materials together into a consistent fabric.

ECLECTIC SCHOOL OF MEDICINE, AMERICAN, or NEW SCHOOL OF MEDICINE. The modern representative of a school of medical thought which existed as early as B.C. 200. Its adherents contended that the wisdom of the various schools was a vain thing, and that the individual could choose for himself between the good and the bad. They, therefore, rejected all knowledge gained by the experience of others. The modern revival took place in America in the early part of the nineteenth century. The modern eclectic professes still to take what is best in medicine, and is still an individualist. In 1826 an eclectic college was founded in New York by Wooster Beach, who was the author of several text-books for the school. Soon afterwards schools were established in Ohio and other States, and at a later period regular colleges in New York, Chicago, and other cities. State societies were formed, and in 1870 the National Eclectic Medical Association was incorporated by the New York Legislature. In 1897 there were 22 eclectic medical colleges, with approximately 750 students. The prominent feature of the school is the theoretical rejection of mercury and most other mineral substances in medicine. Another distinctive point in modern eclectic practice is the use of native medicinal plants, and from the studies of some American eclectic teachers much useful information has been gained respecting these plants. Consult: Beach, *The American Practice of Medicine* (New York, 1838); Wilder, *History of Medicine* (New Sharon, Maine, 1901).

ECLECTIC SCHOOL OF PAINTING. See BOLOGNESE SCHOOL OF PAINTING.

ECLIPSE (Lat. *eclipsis*, from Gk. ἔκλειψις, *ekleipsis*, eclipse, from ἐκλείπειν, *ekleipein*, to for-sake, fail, from *ἐκ*, *ek*, out + *λείπειν*, *leipein*, to leave). Sometimes one or other of the self-luminous heavenly bodies is shut off from our view temporarily by the interposition of some other body between it and the earth. This is called an eclipse when the object temporarily obscured is the sun, and an occultation (q.v.) when it is a star. Non-luminous bodies, which shine only by reflecting solar light, may be 'eclipsed' by having the light cut off by a body passing between themselves and the sun; and they may be 'occulted' by being concealed behind a body passing between themselves and the earth. The term 'transit' is applied to the partial concealment of the sun by the passage across his face of Venus or Mercury, and to the similar phenomena of the passages of Jupiter's satellites across his disk. The causes of eclipse as here suggested are so simple and familiar that it is difficult for us to imagine how deeply eclipses affected men's minds before the dawn of astronomical science. At Rome, at one time, it was blasphemy, and punished by law, to talk publicly of their being due to natural causes. According to some, Luna, when in eclipse, was in the pains of labor; according to others, she was suffering from the arts of wicked magicians. The Chinese imagine eclipses to be caused by great dragons trying to devour the sun and moon, and accordingly they beat drums and brass kettles to terrify the monsters into letting go their prey. Solar eclipses can occur only at the time of new moon, when the sun and moon are in conjunction on the same side of the earth. In a partial eclipse, the sun's disk suddenly loses its circular form; it becomes indented on one side, the indentation slowly increasing for some time, and then diminishing until it disappears altogether. In a total eclipse, the indentation goes on increasing till the whole orb disappears for a time; after a short interval, the sun reappears again, passing through the same phases of obscuration in an inverse order. In an annular eclipse, the whole sun is obscured except a ring or annulus. Lunar eclipses, on the other hand, always occur at full moon, or when the sun and moon are in opposition, and are caused by the moon passing through the earth's shadow. Such eclipses are sometimes partial and sometimes total, but never annular, and in their general phases they resemble those of the sun. The duration of an eclipse is the time of its continuance, or the interval between immersion and emersion. Immersion, or incidence, of an eclipse is the moment when part of the luminary begins to be obscured; emersion is the time when the luminary begins to reappear or emerge from the shadow. When the size of an eclipse is mentioned, the part of the luminary obscured is obtained by dividing its diameter into twelve digits; and the eclipse is said to be of so many digits, according to the number of them contained in that part of the diameter which is obscured.

ECLIPSES OF THE MOON. It has been said that these are caused by the moon passing through the earth's shadow. Before this explanation can be accepted, it must be shown that that shadow extends as far as the moon. This is easily done. Supposing the earth to have no atmosphere, then the shadow is the cone marked in shade in Fig. 1, in which T and S are the centres of the earth and sun. The cone's apex is at O; and the question is, whether the distance OT from the apex to the earth's centre exceeds the moon's distance from the earth. Drawing TB, SA, from the centres of the earth and sun, respectively, perpendicular to the line OBA, tangent to both spheres, and the line TC parallel to the line OBA, we have from the similar triangles OTB TSC, the proportion, OT : TB : : TS : SC. Now, we know that TS, the (mean) distance of the sun, is equal to about 24,000 times TB; also, from the construction, AC = TB; and we know that SA = 112 times TB; whence it follows that SC = 111 times TB. The above proportion then gives OT = 216 times TB, since $\frac{24000}{111} = 216$ nearly. But the moon's average distance is only 60 times TB (the earth's radius). Hence it appears that the length of the earth's shadow is almost four times the average distance of the moon, and that the moon can enter it. Further, it is clear that, should it do so, it may be totally obscured; for it must enter at a point much nearer T than half the distance OT, which is 108 times TB; and everywhere within that distance, it might be shown, the breadth of the shadow is much greater than the moon's disk. But one consideration now remains to be stated to complete the proof of the theory of lunar eclipses. It was mentioned that they only occur at full moon, and we know that to be the only time when the earth is between the sun and moon, and so *has a chance* of throwing her shadow upon it. Why they do not occur every full moon will be explained in treating of the prediction of eclipses.

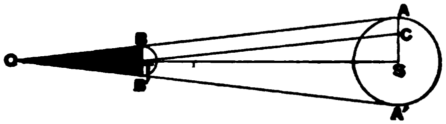


FIG. 1.

In the foregoing explanation, we proceeded on the assumption that the earth has no atmosphere. If the assumption were correct, the earth's shadow would be darker and narrower than it is, and the phenomena of eclipses more sudden. The effect of atmospheric refraction (see REFRACTION) is to bend the rays which fall on the atmosphere in toward the axis of the cone of the earth's shadow, those which pass through the lowest strata of the air being refracted through an angle of 1° 8′, and converging to a point in the line OT (Fig. 1) considerably nearer the earth than the point where the moon crosses her shadow. As a result of this, the moon never enters that part of the shadow which is completely dark; thus, she never loses her light entirely, but appears of a distinct reddish color resembling tarnished copper—an appearance caused by the atmospheric refraction in the same way as the ruddy color of the clouds at sunset. There is another reason why the phenomena of a lunar eclipse are less striking than might be expected from the explanation given relative to Fig. 1. Every shadow cast by the sun's rays

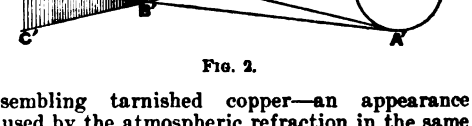


FIG. 2.

necessarily has a penumbra, or envelope, on both sides of the central cone. In the case before us (Fig. 2), suppose a cone having its apex O′ between the sun and the earth, and enveloping each of them respectively in its opposite halves CO′C′ and AO′A′. It is clear that from every point in the shaded part of the cone CO′C′ but without the shadow BOB′, a portion of the sun will be visible—and a portion only—the portion increasing as the point approaches either of the lines CB, C′B′, and diminishing as it approaches the lines BO, B′O. In other words, the illumination from the sun's rays is only partial within the space referred to, and diminishes from its extreme boundary line toward the lines BO, B′O. When, then, the moon is about to suffer eclipse, it first loses brightness on entering this penumbra; so that when it enters the real shadow, the contrast is not between one part of it in shade and the other in full brilliancy, but between a part in shade and a part in partial shade. On its emersion, the same contrast is presented between the part in the umbra and the part in the penumbra. What we should expect on this geometric view of the earth's shadow, actually happens. From the breadth of the penumbra, it happens that the moon may fall wholly within it before immersion in the umbra commences; and so softly do the degrees of light shade into one another, that it is difficult to tell when a remarkable point on the moon's surface leaves the penumbra to pass into the umbra, or the reverse.

Prediction of Lunar Eclipses. We said that lunar eclipses only happen at full moon. They do not happen every full moon, because the moon's orbit is inclined to the ecliptic, on which the centre of the earth's shadow moves at an angle of 5° 9′ nearly. Of course, if the moon moved on an ecliptic, there would be an eclipse every full moon; but from the magnitude of the angle of inclination of her orbit to the ecliptic, an eclipse can only occur on a full moon happening when the moon is at or near one of her nodes, or the points where her orbit intersects the ecliptic. An eclipse clearly can happen only when the centres of the circle of the earth's shadow and of the moon's disk approach within a distance less than the sum of their apparent semi-diameters; and this sum is very small; so that except when near the nodes, the moon, on whichever side of the ecliptic she may be, may pass above or below the shadow without entering it in the least. The moon's average diameter is known to be 31′ 8″.2, and from the *American Ephemeris*, or the *British Nautical Almanac*, we may ascertain its exact amount for any hour —its variations all taking place between the values 29′ 24″ and 33′ 32″. As for the diameter of the circle of the shadow, as seen from the earth's centre, it is easily found by geometric construction and calculation and is shown to vary between 1° 16′ 36″ and 1° 30′ 38″; and its value for any time may be found from the *American Ephemeris*, or the *British Nautical Almanac*, to which value astronomers usually add about 1′ 30″, as a correction for their calculation, which proceeds on the assumption that the earth has no atmosphere. Starting from these elements, it is a simple problem in spherical trigonometry (which may be solved approximately by plane trigonometry by supposing the moon and the earth's shadow to move for a short time near the node in straight lines) to fix the limits within which the shadow and moon must concur to allow of an eclipse. Recollecting that the earth's shadow on the ecliptic is at the opposite end of the diameter from the sun, and that therefore as it nears one node the sun must approach the other—the sun and shadow being always equidistant from the opposite nodes—we find, from the solution of the above problem: (1) That if, at the time of full moon, the distance of the sun's centre from the nearest node be greater than 12° 15′, there cannot be an eclipse; (2) if at that time the distance of the sun's centre from the nearest node be less than 9° 30′, there will certainly be an eclipse; (3) if the distance of the sun's centre from a node be between these values, it is doubtful whether there will be an eclipse, and a detailed calculation must be resorted to, to ascertain whether there will be one or not. It may here be mentioned that before the laws of the solar and lunar motions were discovered with anything like accuracy, the ancients were able to predict the dates of lunar eclipses with tolerable correctness by means of the eclipse cycle or Saros (see Period) of 18 Julian years and 11 days. Their power of doing so turned on this, that in 223 lunations the moon returns almost to the same position in the heavens. If she did return to exactly the same position, then, by simply observing the eclipses which occurred during the 223 lunations, we should know the order in which they would recur in all time coming.

All lunar eclipses are visible in all parts of the earth which have the moon above their horizon, and are everywhere of the same magnitude, with the same beginning and end; and this universality of lunar eclipses is the reason why it is popularly thought, contrary to fact, that they are of more frequent occurrence than solar eclipses. The eastern side of the moon, or left-hand side as we look toward her from the north, is that which first immerges and emerges again. The reason of this is that the motion of the moon is swifter than that of the earth's shadow, so that she overtakes it with her east side foremost, passes through it, and leaves it behind to the west. It will be readily understood from the explanations above given that total eclipses of the longest duration happen in the very nodes of the ecliptic. But from the circumstance of the circle of the shadow being much greater than the moon's disk, total eclipses may happen within a small distance of the nodes, in which cases, however, their duration is less. The further the moon is from her node at the time, the smaller is the eclipse, till, in the limiting case, she just touches the shadow, and passes on unobscured.

Eclipses of the Sun. These are caused, as we have stated, by the interposition of the moon between the earth and sun, through which a greater or less portion of the sun is necessarily hid from view. By a process similar to that used in ascertaining the length of the earth's shadow, it can be shown that the greatest value of the length of the moon's shadow is about 60 semi-diameters of the earth; at the same time, we know that the least distance of the moon from the earth is about 56 semi-diameters. It follows that when a conjunction of the sun and moon happens at a time when the length of the shadow and the distance of the moon from the earth are, or are nearly, equal to the value, above stated, the moon's shadow extends to the earth and beyond it. Should the shadow in these circumstances fall upon the earth, there will be a total eclipse of the sun in all places within it or over which it moves. If L (Fig. 3) be the moon, T the earth, and *ab*L the moon's shadow cast by the sun, there will be a total eclipse of the sun at every point that is completely within the portion *ab* of the earth's surface. Again, the smallest value of the length of the moon's shadow may be shown to be about 58 semi-diameters of the earth, and the greatest distance of the moon from the earth is about 64 semidiameters. Suppose the moon interposed between the earth and sun when these values concur, it is clear that the moon's shadow will fall short of the earth. In this case, the sun cannot be altogether hid from any point of the earth's surface; but this case, or one approximate to it, is that in which there will occur an annular eclipse. In Fig. 4, suppose O to be the apex of the shadow which falls short of the earth, and conceive the cone of the shadow produced earthward beyond O into a second cone O*cd;* then from every point within the section *cd* of the earth's surface, the moon will be seen projected as a black disk on the middle of the disk of the sun, the portion unobscured forming a ring or annulus of light. While in the two cases just described the eclipse is total or regular at places within *ab* (Fig. 3) or *cd* (Fig. 4), respectively, it will be partial at other places; the moon will appear projected against a portion of the sun's disk, making a circular indentation. To ascertain the places at which the eclipse will be partial, we have merely to form the cone of the penumbra of the moon's shadow in the manner explained in treating of lunar eclipses; at all places on the earth's surface within that cone there will be a partial eclipse. A simple calculation shows what is the observed fact, that the cone of the penumbra is not nearly large enough to embrace the whole of the face of the earth directed to the sun; in other words, solar eclipses are not universal, like those of the moon, i.e. they are not seen from all places that have the sun above their horizon at the time of the eclipse, which is the reason that though they are of more frequent occurrence than lunar eclipses, the latter are more frequently seen by the public, and therefore commonly supposed to occur more frequently. There are certain appearances, attending an eclipse of the sun, when it is total, that are very remarkable. The darkening of the orb of day, more particularly when it is unlooked for, is calculated to impress a spectator with vague terror; even when expected, it fills the mind with awe. The sudden darkness, too, is impressive from its strangeness; it resembles neither the darkness of night nor the gloom of twilight. Stars and planets appear, and all animals are dismayed by the gloomy aspect of nature.

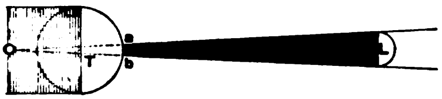


FIG. 3.

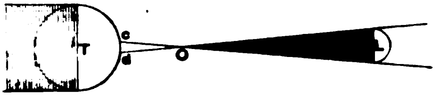


FIG. 4.

There is one important phenomenon attending total eclipses of the sun, which is always seen and the cause of which cannot be said to be as yet fully understood. As long as the total eclipse lasts, there appears round the sun and moon a luminous corona (q.v.), while at its base, and projecting beyond the dark edge of the moon, appear very brilliant prominences, generally of a red color. These prominences are found to be constant attendants on eclipses, and methods have been invented for rendering them visible at any time without the interposition of the moon. (See SUN.) The spectroscope shows that they consist mainly of hydrogen gas in an incandescent state. The prominences are sometimes seen to shoot up like flames, in wild fantastic shapes, with incredible velocity, and to the height of hundreds of thousands of miles.

PREDICTION OF SOLAR ECLIPSES. The period of 18 Julian years 11 days, referred to in treating of the prediction of lunar eclipses, applies equally to solar eclipses; but the ancients, who understood that fact, could find no law of recurrence of solar eclipses within that period so as to predict them. The reason of the failure is obvious; for though solar eclipses recur in a fixed order within the cycle, they are not visible at the same places on their recurrence as when first observed. By modern methods, however, eclipses of the sun may be predicted, with all their circumstances of time and places of observation, with the most perfect certainty. At the time of a solar eclipse, the sun and moon are in conjunction; they are also in or near the same node; and no eclipse can happen if they are further than 18° from the node, or if the latitude of the moon, viewed from the earth, exceeds the sum of the apparent semi-diameters of the sun and moon. When within these limits, it is a problem of numbers and of spherical trigonometry to ascertain whether an eclipse will actually occur and what its circumstances will be.

The number of eclipses of the sun and moon together in a year cannot be less than two—in which case both are solar—or more than seven, five solar and two lunar, or four solar and three lunar; but total solar eclipses are extremely infrequent in any one place, compared with the actual frequency of their occurrence. Thus total eclipses were visible somewhere in the United States during the nineteenth century only in the years 1806, 1834, 1860, 1869, 1878, 1880, 1889, 1900; and in the present century, such eclipses will be visible in the years 1918, 1923, 1925, 1945, 1954, 1979, 1984, and 1994. For a very complete list of eclipse dates, consult: Oppolzer, *Canon der Finsternisse* (Vienna, 1887); Newcomb, "On the Recurrence of Solar Eclipses, with Tables of Eclipses from B.C. 700 to A.D. 2300," in *Astronomical Papers* (Washington, 1882). Consult Lockyer, *Recent and Coming Eclipses* (New York, 1900); Lynn, *Remarkable Eclipses* (London, 1901). See SOLAR SYSTEM.

ECLIPTIC (Lat. *eclipticus*, from Gk. ἐκλειπτικός, *ekleiptikos*, relating to an eclipse, from ἔκλειψις *ekleipsis*, eclipse). The name given to the great circle of the heavens round which the sun *seems* to travel from west to east in the course of a year. It took its name from the early observed fact that eclipses (q.v.) happen only when the sun and moon are in or near this circle. Attention about sunset or sunrise shows that the sun is constantly altering his position among the stars visible near him, leaving them every day a little farther to the west; that this motion is not exactly east and west, or parallel to the celestial equator, becomes evident by observing that the sun's height at midday is constantly altering. It was discovered very early in the history of astronomy that twice a year, about March 21st and September 23d, the sun is exactly on the equator. The two points of the equator on which the sun then stands are the equinoctial points (see EQUINOXES; EQUINOCTIAL), and are the intersections of the equator and ecliptic. Again, there are two days in the year on which the sun reaches its greatest and its least midday elevation in the Northern Hemisphere—the first is the 21st of June; the second, the 21st of December. On these days the sun has reached his greatest distance from the equator either way, and the points in his course where he thus seems to pause or halt in his retreat from the equator are called the solstices (*solis stationes*). These four points are distant from one another by a quadrant of the circle, or 90°. Each quadrant is divided into three arcs of 30°, and thus the ecliptic is divided into twelve arcs of that length, called signs of the zodiac (q.v.). These arcs or signs have been named after constellations through which the ecliptic passes. As the equinoctial points are not fixed, but recede yearly westward about 50″, and in the century about 1° 24′, the same constellations and signs that coincided when the division of the ecliptic took place no longer coincide. The constellation of the Ram, for instance, which originally stood in the first arc or sign, now stands in the second, every constellation having advanced forward 30°, or a whole sign. Modern astronomers therefore pay little attention to these constellations and signs, but count celestial longitudes from the existing spring equinoctial point from 0° to 360°. Not only do the points change where the ecliptic and equator cross each other, but the angle between these two circles, called the obliquity of the ecliptic, is also variable. It is at present nearly 23.5°, and is diminishing at the rate of about 50″ in a century. Were it to go on diminishing always, the ecliptic and the equator would at last coincide. The decrease, however, has a limit; the obliquity oscillates between two definite bounds, which it can never pass. It has been calculated that the diminution will continue for about 150 centuries, when the obliquity will only amount to 22.25°. After that it will again increase, tending toward an upper limit of about 25°. These slight alterations cannot sensibly affect the seasons.

The physical cause of this change of the obliquity is the gravitational action of the other planets, especially Jupiter, Mars, and Venus, on the mass of the earth. The fact of the change was known to astronomers in very ancient times; Herodotus mentions an old tradition of the Egyptians that the ecliptic had formerly been perpendicular to the equator—a notion into which they were most probably led by observing for a long series of years that its obliquity was constantly diminishing. Though it was not until after the discovery of the law of gravitation that the change of the obliquity could be explained, yet that it was changing was long believed by many astronomers, although some doubted whether the differences in the values at different times were not due to errors of observation. The earliest known measure of the obliquity of the ecliptic was probably made in China.

EC′LOGITE (from Gk. ἔκλογος, *eklogos*, selected, from ἐκλέγειν, *eklegein*, to select, from ἐκ, *ek*, out + λέγειν, *legein*, to gather). A variety of crystalline rocks, remarkable for its composition and great beauty. It has a ground mass of pale-green pyroxene and hornblende, in which reddish crystals of garnet and blue crystals of cyanite are included. The rock is of rare occurrence, being found only in a few regions where Archæan gneisses and schists are exposed. The type locality for eclogite is the Bavarian Fichtelgebirge.

ECLOGUE (Lat. *ecloga*, Gk. ἐκλογή, *eklogē*, selection, from ἐκλέγειν, *eklegein*, to select). A pastoral poem, in which are related the loves and adventures of shepherds and shepherdesses in some ideal scene and period. This kind of poetry flourished among the ancients, Theocritus and Vergil being well-known examples. Under the name of pastorals, eclogues were fashionable in the sixteenth century. A good English specimen is Spenser's *Shepherd's Calendar*. They were revived in the eighteenth century by Ambrose Philips and Pope, but are no longer written. The term, however, is still applied to poems descriptive of country life and scenes. For the recent treatment of the eclogue, consult Bridges. "New Poems," in *Poetical Works* (London, 1899). See PASTORAL POETRY.

EC′NOMUS. A hill near Licata, Sicily, which gave its name to the famous naval battle in which Regulus in B.C. 256 vanquished the Carthaginians.

ÉCOLE DES BEAUX-ARTS, ā′kōl′ dā bō′zär′ (properly ECOLE NATIONALE ET SPÉCIALE DES BEAUX-ARTS). The national school of the fine arts in France, probably the most important institution of the kind in the world. It was founded in 1648, coincidently with the Académie Royale de Peinture et de Sculpture, as the academic school where each professor in turn gave instruction in drawing. It did not receive its official title until 1793. Since then the only changes have been in the form of its administration. In 1815 the Académie des Beaux-Arts was given its present name, and in 1863 the outside ateliers, which are practically workshops, were added to the main École. The Academy judges the yearly competition for the Prix de Rome (q.v.), directs the Academy at Rome, and has charge of the École generally. The Academy of Architecture was annexed to the Academy of Painting and Sculpture in 1671, with François Blondel as its first professor, and was incorporated into the Académie des Beaux-Arts in 1793. The School of Architecture is now one of the most important branches of the École des Beaux-Arts. In 1666 the Prix de Rome was instituted, and in the same year the Académie de France at Rome was established by Colbert, with the practical assistance of Charles Errard (q.v.), its first director. By the study of the antique the student perfects himself in form and line, and attains that skill in drawing and composition for which the Ecole has always stood, even to the detriment of color, and which, more than any other factor, has influenced French art. The site of the Academy since 1803 has been the Villa Medici, on the Pincian Hill.

The courses in drawing, painting, sculpture, architecture, engraving, modeling, and gem-cutting at the Ecole des Beaux-Arts are free to both men and women between the ages of fifteen and thirty. Foreigners, not being eligible for the Prix de Rome, are not subject to the age regulation. The student who passes the examinations in any one of the courses must already have had experience in some special branch of art. The whole system of teaching at the Ecole is by means of competitions, and the grade obtained in these marks the student's relative advancement. The outside ateliers are in charge of the professors or 'patrons,' and in order to enter these the student pays a small fee. Some of his work is required to be done *en loge*, but much may be worked up in the ateliers. The regular course is nominally from eight to ten years, but a student may remain as long or short a time as he pleases, provided he visit the school twice a year, in order to keep his name on the rolls. The whole number of students in the school is approximately 2000, most of whom are French. The number of Americans who enter is larger than that of any other foreign nation, and the influence of the Ecole on American art and artists has been very great. The teachers, of whom there are (1905) 30 in the Ecole proper and 13 in the ateliers, are selected from among the most celebrated French artists. But they are paid a purely nominal fee, the equivalent of $240 in our money, for work which takes them two half-days each week of the school year.

The Palais des Beaux-Arts, the home of the Ecole, on the Quai Malaquais, was begun by Debret in 1820 and finished by Duban in 1863. It contains a noted collection of copies of famous paintings made by the winners of the Prix de Rome; casts of statues and models of ancient buildings; drawings by old masters; the Hémicycle of Delaroche (q.v.). Consult: Delaborde, *L'Académie des Beaux-Arts* (Paris, 1891); Landan, *Annales du Musée et de l'Ecole Moderne des Beaux-Arts* (Paris, 1802 et seq.); Stranahan, *History of French Painting* (New York, 1898); Lenoir, *Histoire des arts en France* (Paris, 1811); Penarun, Roux, and Delaire, *Les architectes élèves de l'Ecole des Beaux-Arts* (Paris, 1895); *Architectural Record* (Beaux-Arts No., January, 1901); Flagg, "Ecole des Beaux-Arts," *Architectural Record*, vol. iii.

ÉCOLE DES FEMMES, â'kôl' dâ fâm, L' (Fr., the school of wives). A five-act comedy by Molière, produced at the Palais Royal, December 26, 1662. The principal character in it, Arnolphe, distrusting the constancy of all women of the world, rears a peasant's daughter, Agnes, in a convent, as his future wife, but no sooner withdraws her from seclusion than she falls in love with the youthful Horace. The piece was Molière's greatest success, but brought upon him much criticism, against which he defended himself in the *Critique de l'école des femmes*, and later in the *Impromptu de Versailles*.

ÉCOLE DES MARIS, dâ mâ'rē', L' (Fr., the school of husbands). A three-act comedy in verse by Molière, produced at the Palais Royal, in 1661. The principal character is Sganarelle, a drunken, brutal, self-seeking peasant, who is the guardian of a beautiful young girl. The rôle was created by Molière himself. The general idea of the piece is borrowed from the *Adelphi*, of Terence, and details are taken from Boccaccio, and probably from Lope de Vega's *Discreta enamorada*.

ÉCOLE POLYTECHNIQUE, pô'lē'tĕk'nēk' (Fr., polytechnic school). See MILITARY EDUCATION.

ECOL'OGY, or **ŒCOL'OGY** OF PLANTS (from Gk. *οἶκος*, *oikos*, house + *-λογία*, *-logia*, discourse, from *λέγειν*, *legein*, to say). That division of botany which has to do with the mutual relations between plant organisms and their environment. Until recently the subject-matter of ecology has not been systematically treated, although certain phases of the subject, such as pollination, seed-dispersal, protection, symbiosis, have been for some time grouped together and denominated 'biology,' especially by German authors, as Kerner (1887), Wiesner (1889), and Ludwig (1895). The first to treat ecology systematically was Warming, of Copenhagen, who, in 1895, gave a résumé of the ecological factors and their influence, and discussed the ecological plant geography of the world, dividing plants into four groups — viz. hydrophytes, mesophytes, xerophytes, and halophytes (qq.v.). In 1898 Schimper gave a much more extended treatment of the world's vegetation, but from a slightly different point of view, basing his main subdivisions on temperature, and discussing in each subdivision the ecological relations of the three types of climatic formations (forest, grassland, desert), and also, but very briefly, of the edaphic formations or plant societies.

Ecology is as yet but incompletely organized, and the subdivisions here proposed are necessarily tentative. There are three more or less distinct lines of ecology, as the subject is now studied: (1) The ecology of the various plants, their tissues and organs—i.e. the study of the relation of plants, tissues, and organs to their environment—may be called physiological ecology, since this division of the subject is related to physiology, or may even be classed as a part of it. Physiological ecology has two further subdivisions: Anatomical ecology, which concerns itself with the origin, development, and meaning of plant tissues, and organographic ecology (or simply organography), which concerns itself with the origin, development, and meaning of plant forms and organs. (2) The ecology of edaphic plant societies—i.e. the study of their origin, development, and life relations—may be called physiographic ecology, since this subject is related to physiography, or may even be classed as a part of it. (3) The ecology of climatic plant formations—i.e. the study of the great forest, grass, and desert formations of the globe in relation to climatic factors—may be called geographic ecology, or ecological phytogeography, since this subject is essentially a part of geography. It is more convenient to speak of this third subdivision under the head of Distribution of Plants (q.v.).

Physiological ecology, whether anatomical or organographic, is concerned chiefly with the origin and meaning of the tissues and organs of plants. In the interpretation of this field there are two prominent theories, which may be briefly outlined. The older and commoner theory is based on teleological assumptions, and may be called the theory of purpose or design. The theory of design has also had two aspects: (1) That in which rigid special creations were postulated in order to account for the relations between structures and functions; (2) that in which natural selection, acting for many generations, was supposed to be the cause of specialized structures obviously adapted for certain ends. The newer and less common theory is based on dysteleological assumptions, and may be called the accident or gall theory. Plant structures are regarded as the result of various purely physical and chemical forces; if a structure is of value, it is but a matter of accident. Just as a gall is regarded by every one as the result of forces set in operation by the insect's sting, so all organs and tissues are the inevitable result of mechanical agents. Possibly the correct standpoint is an intermediate one. Structures cannot be built, nor functions carried on, contrary to chemical and physical laws; but within certain limits there is perhaps room for successful variation, and hence for natural selection and the gradual improvement of structures in relation to plant functions. Some of the arguments for natural selection and the teleological view are found in the structure and mechanics of stomata, which are the opposite of what one would theoretically expect; the storage of water or reserve foods is a phenomenon hard to account for without natural selection. Experiments show that some plants are rigid and some plastic; rigid plants have commonly lived for ages in rigid habitats, as is particularly true of desert plants. Plastic plants, on the other hand, often live in variable habitats, the best examples of all plastic plants being the amphibious species. It would seem as if permanence of habitat causes the development of rigid structures, as is well shown in the Begonia, which has remained xerophytic in structure through generations of mesophytic culture—i.e. culture in moist surroundings. And it would seem as if the marvelous plasticity of such plants as Ranunculus, Nasturtium, Polygonum, Proserpinaca, Sium, etc., is a result of long life in variable habitats. The desert plant shows the natural selection of adapted but rigid forms, while the amphibious plant shows the selection of the capacity to vary, a far subtler type of selection. While these arguments favor the natural selection and teleological theories, current dysteleological views have certainly clarified the atmosphere. The extreme views of some teleologists, who see a purpose in everything, must surely be discarded; but it remains for the future to strike a proper balance between the design and accident theories in ecology. For the present, therefore, the ecologist should strive to ascertain the influence of external agents on plant form, and should also seek to discover the advantages possessed by certain forms in the performance of the plant functions, but should leave the determination of the exact relation between form and function to future investigation.

The subject-matter of anatomical ecology is not presented as such in this work. The purely morphological aspects are treated under Anatomy of Plants. Anatomical matter is also presented in connection with the topics Hydrophyte; Xerophyte; Leaf; Root; Symbiosis. Organographic ecology will be treated in connection with the various organs of plants (see Leaf; Stem; Root; Seed; Pollination; also Color; Duration; Vegetative Propagation), and with various plant forms. (See Epiphytes; Lianas; Saprophytes; Symbiosis.) The topics treated in physiographic ecology, and to some extent in phytogeography, involve organographic material. Physiographic ecology will be treated from the standpoint of topographic habitats (see Beach Plants; Benthos; Dune Vegetation; Heath; Meadow; Plankton; Rock Plants; Ruderal Plants), as well as from the standpoint of the water relations (see Hydrophyte, Mesophyte, Xerophyte) and chemical relations of the soil. (See Halophyte.) The ecological aspects of geographic botany are presented under Distribution of Plants; Alpine Plant; Desert Vegetation; Forest; Grassland; Thicket.

Bibliography. Costantin, *La nature tropicale* (Paris, 1899); Flahault, *Essai d'une carte botanique et forestière de la France* (Paris, 1897); Goebel, *Organography of Plants* (Oxford, Eng., 1900); Haberlandt, *Physiologische Pflanzenanatomie* (Leipzig, 1896); *Eine botanische Tropenreise* (Leipzig, 1893); Lubbock, *Buds and Stipules* (London, 1899); Ludwig, *Lehrbuch der Biologie der Pflanzen* (Stuttgart, 1895); Wiesner, *Biologie der Pflanzen* (2d ed., Vienna, 1901); Kerner, *Natural History of Plants*, trans. by Oliver (London, 1895); Coville, "Botany of the Death Valley Expedition," in *United States Department of Agriculture* (Washington, 1893); Gray, *Scientific Papers* (Boston, 1889); Kearney, *Botanical Survey of the Dismal Swamp Region* (Washington, 1901); MacMillan, *Metaspermæ of the Minnesota Valley* (Minneapolis, 1892); Mayr, *Waldungen von Nordamerika* (Munich, 1890); Merriam, *Life Zones and Crop Zones of the United States* (Washington, 1898); Pound and Clements, *Phytogeography of Nebraska* (Lincoln, 1900). Consult also authorities referred to under Botany; Distribution of Plants.

ECONOMIC ASSOCIATION, American (Lat. *œconomicus*, from Gk. *οἰκονομικός*, *oikonomikos*, relating to the management of a household, from *οἰκονομία*, *oikonomia*, management of a household, from *οἶκος*, *oikos*, house + *νόμος*, *nomos*, law). An organization formed in 1885 and composed mainly of persons interested in the study of political economy or the economic phases of political and social questions. In 1906 it had about 1000 members, made up about equally of teachers of political economy and related subjects, and business men, journalists, lawyers, and politicians interested in the theories of political economy and their application. Its chief feature is its annual meeting, which usually takes place in the last week in December, a convenient city being selected in the East and West in alternate years. In recent years its meetings have been held concurrently with those of the American

Historical Association and of the American Political Science Association, joint meetings of the several associations being devoted to questions of interest to specialists in two, or in all three fields of scientific inquiry. The publications of the association consist of an annual report, giving the proceedings of the annual meeting, and monographs on economic subjects published at intervals. President (1906), Professor F. W. Taussig, Harvard University.

ECONOMICS. See POLITICAL ECONOMY.

ECONOMIZERS, or FEED-WATER HEATERS. Devices for utilizing the heat of the waste gases from steam boilers to heat the water with which the boiler is fed. After passing through the boiler-flues the furnace gases still retain considerable heat which ordinarily escapes up the chimney. The economizer is so placed that it receives these gases and extracts a portion of the heat remaining in them. It consists of a series of tubes, made up in sections, connected at the ends and placed in a chamber through which the gases from the boiler pass to the chimney. The feed-water is forced through the tubes while the hot gases circulate around them. A different form of economizer is one which uses the heat of the flue gases to heat the air supplied to the furnace.

ECONOMY. A village in Beaver County, Pa., 17 miles northwest of Pittsburg, on the Ohio River and on the Pennsylvania Company Railroad (Map: Pennsylvania, A 3). It was founded by the "Harmonists" in 1825, after their return from Indiana. Population (township), 1890, 1029; in 1900, 1062. See HARMONISTS.

ÉCORCHÉ, â'kôr'shâ' (Fr., flayed). A figure in which the muscles are represented, stripped of the skin, for purposes of art study. From a portion of the figure the upper muscles are also removed, so as to exhibit those which lie nearer to the bone. It is not uncommon to represent the écorché in action, in the form of the fighting gladiator. The first person who did so was Salvage, a French artist and anatomist. To render the studies of pupils more complete, he had this figure engraved in all the points of view, and more or less denuded of flesh, till at last it was little more than a skeleton, the only muscles represented being those which immediately cover the bones. Figures of this kind can now be procured both in plaster and papier-maché. Fragments or parts of the figure in écorché may also be obtained, and few artists' studios are without one or more of such figures.

ÉCORCHEURS, â'kôr'shẽr', LES (Fr., the flayers). Lawless bands infesting the rural districts of France and Belgium during the Hundred Years' War. They are first heard of in 1435, when, led by Villandras and Crabannes the Bastard, they began to rob, murder, and strip all unprotected wayfarers.

ÉCOSSAISE, â'kô'sâz' (Fr., Scotch). A dance of Scottish origin. It was written in 3—2 or 2—4 time, and played upon the bagpipes. The modern *écossaise* is a species of contredanse. Schubert wrote several *écossaises* for the pianoforte.

ÉCRASEUR, â'krâ'zẽr' (Fr., crusher). The name of a long steel instrument, invented by the distinguished French surgeon Chassaignac, and consisting of a fine chain, which passed round any structure—as the base of a tumor, for example—gradually constricts it, and finally crushes its way through it by means of a screw or rack for tightening the chain, which is worked at the end of the handle. The advantage of this instrument over the knife is, that it causes little or no bleeding, the torn vessels spontaneously contracting and closing. It is specially applicable for the removal of polypi and certain tumors.

ECSTASY (Lat. *ecstasis*, from Gk. ἔκστασις, *ekstasis*, displacement, astonishment, from ἐξιστάναι, *existanai*, to displace, from ἐκ, *ek*, out + ἱστάναι, *histanai*, to stand). A state of consciousness (q.v.) characterized by intense emotional excitement, concentration of attention, and loss of self-control. There are many grades of ecstasy, from overpowering joy or grief to a temporary frenzy closely resembling mania. In the Neo-Platonic philosophy of the early Christian centuries, ecstasy denoted a seizure or rapture in which the individual was supposed to transcend the distinction of subjective and objective, to come into direct union with God, and to know the ultimate nature of things. The ecstatic state of mysticism is somewhat similar. It is intended to liberate the soul from the body, to bring inspiration, and to induce the contemplation of supernatural objects. The most common form of ecstasy results from overmastering religious sentiments. Religious ecstasy has appeared from time to time, especially in the Middle Ages, as a widespread epidemic, leading to the most extravagant actions in whole groups of individuals. The term ecstasy is also used in mental pathology, to denote an abnormal mental condition resembling the catalepsy of deep hypnosis. There are, however, two points of difference. In ecstasy, consciousness is not lacking, the mind being rather dominated by a single idea; and there is subsequent memory of the ecstatic state. Consult: Galton, *Inquiries into Human Faculty* (London, 1883). For illustrations, see CONVULSIONARIES; DANCING MANIA; TERESA, SAINT.

EC'THESIS (Neo-Lat., from Gk. ἔκθεσις, *ekthesis*, exposition, from ἐκ, *ek*, out + θέσις, *thesis*, position, from τιθέναι, *tithenai*, to place). The name given to an edict issued by the Emperor Heraclius, in 638, for the purpose of settling the troubles caused by Monothelitism. It confirmed the monothelitic doctrine and failed of its object. It was annulled by Constans II. in 648. See MONOTHELITISM.

ECTHY'MA (Neo-Lat., from Gk. ἔκθυμα, *ekthyma*, pustule, from ἐκθύειν, *ekthyein*, to break out, from ἐκ, *ek*, out + θύειν, *thyein*, to rush). A pustular affection of the skin, of the temporary character of an eruption, in which yellowish pustules occur which often reach the size of a split pea, and have a red, slightly elevated, hard base. In the course of two or three days after the appearance of the pustule, it gains its full size, and after seven to ten days it is replaced by a scab, which adheres firmly to the base, and is somewhat concave. On its removal, a deep red mark, a new scab, an ulcer, or a healed scar remains. There is no premonitory or prepapular stage. It thus resembles impetigo (q.v.), as well as in being due to pyogenic cocci. It occurs only in debilitated people, especially in cases of chronic alcoholism, excesses, debauchery, cachexia, etc., and therefore is generally found in vagrants, and in inmates of jails and almshouses. It also occurs in cases of syphilis, variola, glanders, diabetes, and nephritis. The Staphylococcus pyogenes aureus, albus, or citreus is the causative bacillus. The lesions are inoculable, and may appear when the patient has scratched the bites of fleas, lice, etc. Treatment must be directed to renovating the system with proper food, habits of cleanliness, and general hygiene, bitter tonics, saline and alkaline laxatives, and diuretics. The crusts should be removed with antiseptic washes, and the areas treated with iodoform, carbolic acid, or bichloride of mercury, resorcin, boric acid, or salicylic acid.

ECTODERM (from Gk. ἐκτός, *ektos*, outside + δέρμα, *derma*, skin), or EPIBLAST. The outer cellular layer of the embryo. See EMBRYOLOGY.

ECTOPLASM. See CELL.

EC'TOR, or **HEC'TOR.** (1) The father of Sir Kay and foster-father to King Arthur, in the Arthurian legends. (2) The brother of Sir Launcelot, in the Arthurian legend, who, after that knight's death, made an expedition to the Holy Land, where, on Good Friday, he met his death.

EC'TOTROPH'IC. See MYCORHIZA.

EC'TOZO'A (Neo-Lat. nom. pl., from Gk. ἐκτός, *ektos*, outside + ζῷον, *zōon*, animal). A term in contradistinction to Entozoa, designating those parasitic animals which live upon the external parts of other animals, as lice, ticks, etc. Such also are many of the entomostracous crustaceans, parasitic upon fishes, these last being called more particularly Epizoa. See ENTOZOA.

ECTRO'PION (Neo-Lat., from Gk. ἐκτρόπιον, *ektropion*, everted eyelid, from ἐκ, *ek*, out + τρέπειν, *trepein*, to turn). A term applied to eversion of either eyelid exposing a portion of the conjunctiva, the mucous membrane that lines the inner surface of the lids. The lower lid is the more frequently affected. The exposed conjunctiva becomes red and thickened; there is an overflow of tears, causing an irritation and eczematous condition of the skin of the lower lid. Inflammation of the conjunctiva covering the eyeball and sometimes of the cornea may result from inability to close the lids. Ectropion may be caused by cicatricial contraction after burns and wounds ('cicatricial ectropion'); by paralysis of the facial nerve, causing drooping of the lower lid alone ('paralytic ectropion'); by the relaxation of skin and muscles occurring in old persons, and affecting only the lower lid ('senile ectropion'); by spasmodic contraction of the orbicularis muscle ('spasmodic ectropion'); and by long-continued inflammation of the eyelid or conjunctiva. Proper bandaging and the application of silver nitrate may cure in some cases; in other cases, operative treatment is necessary.

EC'TYPE (Lat. *ectypus*, Gk. ἔκτυπος, *ektypos*, from ἐκ, *ek*, out + τύπος, *typos*, figure). A cast in relief of an ornamental design, produced from a mold or a figured copy of an inscription.

ECUADOR, ĕk'wȧ-dôr, *Span. pron.* ā'kwȧ-dōr' (Sp., Equator, so called because the country is crossed by the equator). A republic of South America, situated on the western coast of the continent and bounded on the north and east by Colombia, on the south by Peru, and on the west by the Pacific Ocean (see accompanying map). The area of Ecuador is about 118,627 square miles; it cannot be stated with accuracy, and there are pending boundary disputes with Peru and Colombia. The Galápagos Islands in the Pacific belong to Ecuador and are included in the above statement.

TOPOGRAPHY. Ecuador may be divided into three physiographic regions, the coast, the Andean highland, and the eastern plains. The coastal region includes a strip of varying width, but averaging about eighty miles between the base of the Andes and the Pacific shores. It is crossed by several small rivers and by mountain spurs of the Andes. The highland region is defined by two parallel ranges or cordilleras connected by a number of mountain knots (the most important of which is the Loja knot, near the Peruvian frontier), and traversing the country in a direction from north to south. The Western Cordillera contains the highest peak in Ecuador, Chimborazo, 20,498 feet, but its summits are generally lower than the eastern range, which is crowned by Cotopaxi, 19,613 feet; Antisana, 19,335; Cayambé, 19,186; and by several others (Altar, Sangay, Tunguragua) exceeding 16,000 and 17,000 feet. The Pacific range is crossed by the lofty Tambo Pass at an altitude of 10,400 feet. Most of the higher elevations are volcanoes, Cotopaxi being the highest active cone in the world. In the western range, near Quito, is the volcano Pichincha, 15,918 feet. Between the parallel ranges and their connecting ridges lie elevated basins, the centres of agriculture and population, which have an average height of about 8000 feet. East of the Andes the surface falls rapidly to the vast Montaña or forests of the Amazonian plains. Ecuador is watered by many streams, which flow either into the Pacific or the Amazon. Those of the latter system are the more important and include the Napo (with its affluents, the Aguarico and Curaray), the longest river of Ecuador; the Putumayo, Pastaza, Morona, and Santiago. Most of them, being interrupted by rapids, are navigable but for short distances. The western rivers are of little consequence. The chief among them are the Mira and Esmeraldas. In the south, the Guayas reaches the Gulf of Guayaquil through a long estuary. Lakes are numerous, but mostly small.

CLIMATE. Ecuador has naturally a tropical climate, which, however, is considerably modified by the great elevation of the surface. In the low coast regions and the plains of the eastern portion, as well as in the deep river valleys, the climate is hot and rainy, the annual average temperature seldom falling below 80 degrees. The most salubrious portions of the country are the elevated valleys of the Andes, lying at an altitude varying between 7500 and 9000 feet, where the temperature is moderate and fever almost unknown, and perpetual spring may be said to reign. Owing to their tropical situation, the snow-line of the Ecuador mountains is very high, and human habitations are met with at 13,360 feet. Generally speaking, there are two seasons, the rainy season or winter, lasting from December to May, and the dry season, from June to November. Only in the elevated valleys, however, are the seasons marked with distinctive regularity.

Flora. The flora of Ecuador does not differ essentially from that of other western countries of South America, and especially resembles that of Colombia and Peru. In the lower portions, in the east and on the foot-hills, the vegetation is purely tropical. Thick forests of cabinet-woods and of medicinal plants occupy a considerable portion of the territory. Above 6000 feet the vegetation is more northern, while above 10,000 feet trees are seldom met with, and the vegetable life consists of shrubs and coarse grasses.

Fauna. The fauna includes the common South American species, such as several varieties of monkey, the jaguar, tapir, llama, vicuna, alpaca, etc. Birds, which include the condor and a large number of humming-birds which are restricted to individual volcanic cones, are represented in numerous species.

Geology and Mineral Resources. The Andes contain Archæan gneisses and granites and sedimentary strata of Paleozoic and Mesozoic age, all closely folded and broken in many places by eruptions of volcanic rocks. The coast and the eastern plains are floored by Cretaceous and Tertiary strata.

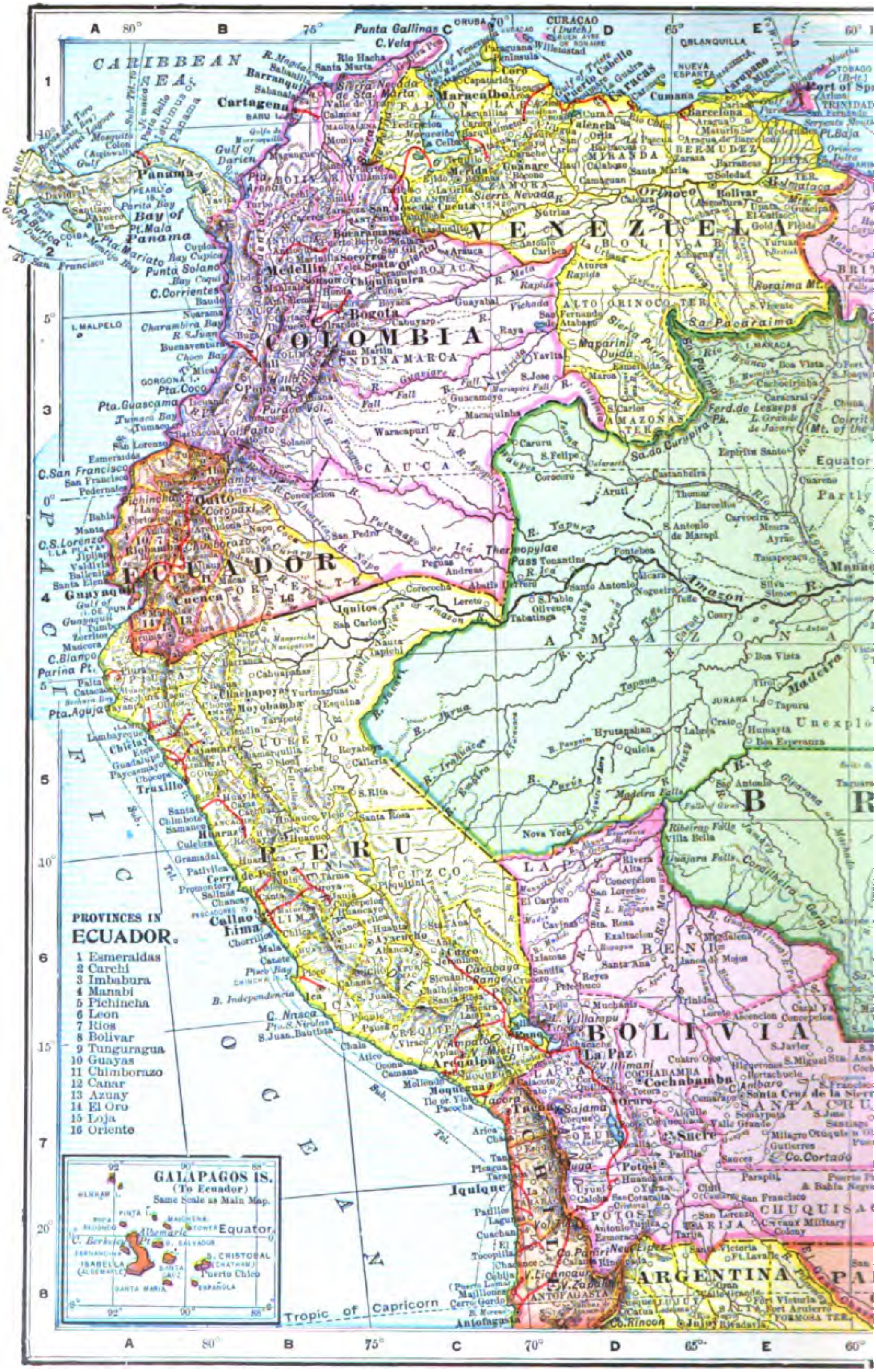
Very little has been done to develop the mineral resources of Ecuador, but their value is known to be very great. In the province of Esmeraldas there are placer deposits of gold along the Santiago, Uimbi, and Cochabibi rivers, which are worked by hydraulic methods, and near Zaruma, Province of Oro, gold quartz is mined by an American company. The export of gold in 1903 was over $700,000. Copper, iron, coal, and petroleum are believed to occur in quantities to warrant exploitation. Platinum is found in the Esmeraldas washings, and a small amount of silver is exported.

Agriculture. The agricultural resources of Ecuador are considerable. The soil is of singular fertility and produces a large variety of crops. The principal product is cacao, which is cultivated chiefly in the provinces of Manabi, Guayas, and Oro; its production has been steadily rising, amounting in 1904 to over 28,500,000 kilograms (1 kilo = 2.2 lbs.). Next in importance is coffee, which is cultivated in several districts; in 1904 there were exported 3,490,000 kilograms of coffee. The conditions for sugar cultivation are very favorable, and the industry is gradually extending. Tobacco, ivory-nuts, rice, Indian corn, as well as the common cereals, such as wheat, barley, oats, and a number of medicinal and industrial plants, are also raised for the home market, as well as for export. The rubber-tree abounds, and the collecting of rubber and planting of rubber trees is a growing industry; in 1903 the export of rubber was nearly 520,000 kilograms. The cattle and sheep holdings are large, and considerable alfalfa is cultivated. Cheese is a staple food.

Manufactures, Commerce, and Transportation. With the exception of some coarse fabrics for native consumption, and straw braid used for the manufacturing of Panama hats and other straw articles, Ecuador has hardly any manufactures. The commerce, although steadily increasing, is as yet unimportant. The exports consist chiefly of cacao. Coffee, sugar, ivory-nuts, rubber, are shipped, and some gold. The exports have increased from 14,052,514 sucres (48.7 cents) in 1893 to 18,566,000 sucres in 1905. The imports, consisting mostly of textiles, metal ware, and necessaries of life, have risen during the same period from 10,052,163 sucres to 15,734,000 sucres. The trade is mostly with France, Germany, Great Britain, and the United States. The commerce with the United States in the period of 1890-1905 has increased as follows: Imports from Ecuador, in 1890, $836,437; in 1905, $2,502,175. Exports from the United States in 1890, $903,159; in 1905, $1,750,378. The United States imports most of Ecuador's rubber and a considerable portion of its cacao, and exports to it railway supplies and foodstuffs. The chief ports are Guayaquil, Manta, and Esmeraldas. The mountainous surface of the country is unfavorable to the development of transportation facilities. The roads are mostly for pack-animals, being almost impassable during the rainy season. The chief road runs from Quito (q.v.), the capital, toward Guayaquil and the ocean. Of open railway lines Ecuador has only about 170 miles. A line 286 miles in length, from Quito to Guayaquil, is being constructed; in 1904 it was open to Guamote, 125 miles, in 1905 to Riobamba, in 1906 to Mocha—190 miles, and in 1907 it reached Ambato. There is a telegraph communication between Quito and Guayaquil, and also with Colombia, while Guayaquil has cable connection with Panama and Peru.

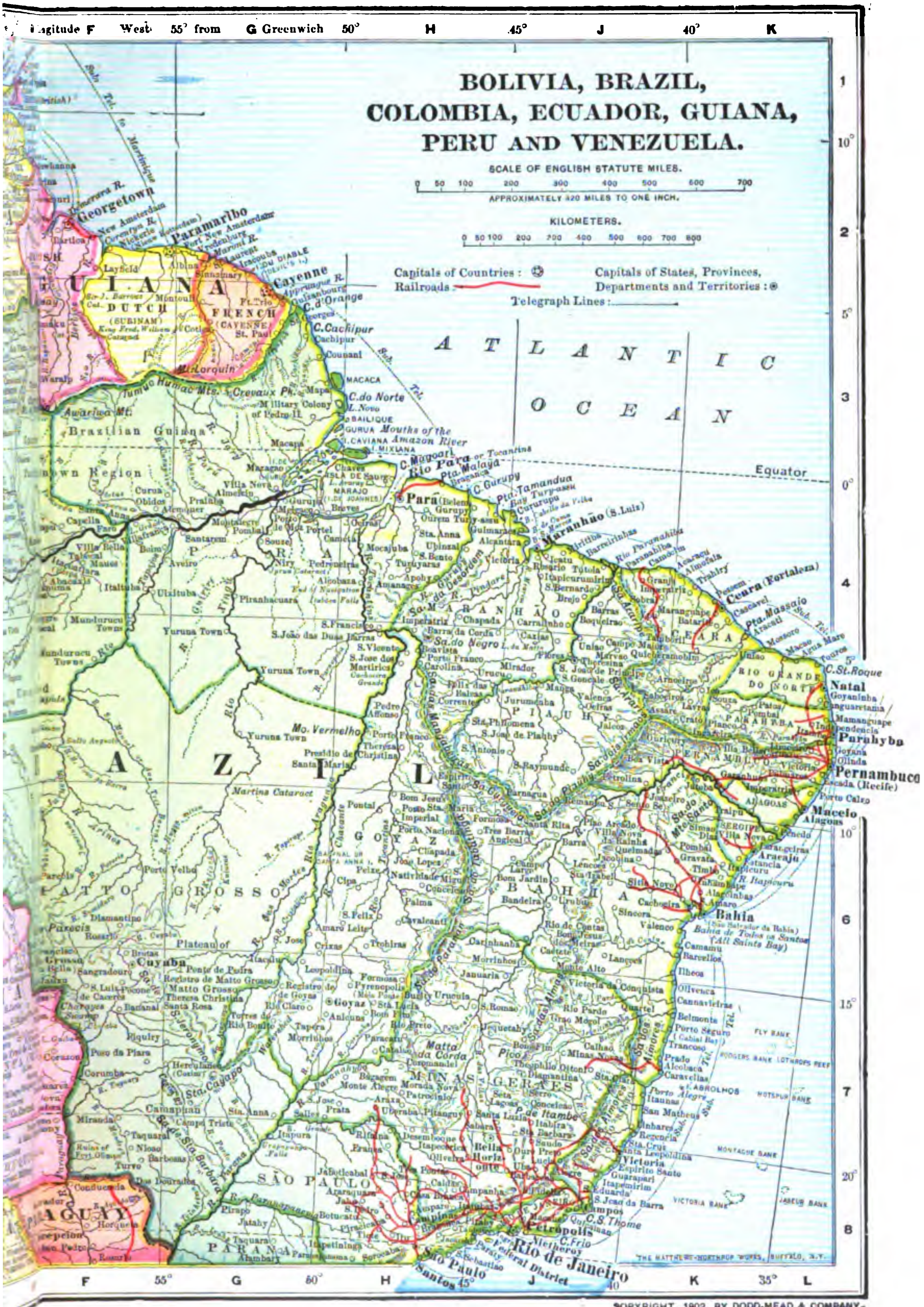
Government. The Constitution dates from 1830 and has been frequently altered. The executive authority is shared by the President with a responsible ministry. The President is elected directly for a period of four years. The Vice-President is elected in the same manner, but two years after the election of the President, serving accordingly across two terms. The Congress consists of two Houses. The members of the Senate (two for each province) are elected directly for four years. The House of Representatives consists of members elected directly for two years, at the rate of one Deputy for every 35,000 inhabitants, with a Deputy for every additional 15,000 inhabitants or more. The Indians, being practically in a condition of slavery, are unrepresented. Congress meets biennially, but can be summoned for an extra session by the President. The voting franchise is restricted to every male citizen of twenty-one years of age who is able to read and write. The local administrators, from the governors of the provinces down to the lieutenants of the parishes, are all appointed by the President and removed at his discretion. For administrative purposes Ecuador is divided into sixteen provinces, besides the Galápagos Archipelago, which is administered by a territorial chief. For the administration of justice there are a supreme court of six judges appointed by the Congress, six superior courts or courts of appeal, whose judges are also appointed by the Congress, and a number of commercial and other inferior courts. For military defense Ecuador has a standing army of about 3300 men and a national guard about 30,000 strong. The navy consists of a torpedo-boat and a transport. See Armies and Navies.

Finance. The revenue of Ecuador is derived mostly from customs duties and to some extent from taxes on real estate and income, and from Government monopolies and property.



PROVINCES IN ECUADOR.

1 Esmeraldas
2 Carchi
3 Imbabura
4 Manabi
5 Pichincha
6 Leon
7 Rios
8 Bolivar
9 Tunguragua
10 Guayas
11 Chimborazo
12 Canar
13 Azuay
14 El Oro
15 Loja
16 Oriente



BOLIVIA, BRAZIL, COLOMBIA, ECUADOR, GUIANA, PERU AND VENEZUELA.

SCALE OF ENGLISH STATUTE MILES.

APPROXIMATELY 420 MILES TO ONE INCH.

KILOMETERS.

Capitals of Countries : ⊛

Railroads

Capitals of States, Provinces, Departments and Territories : ⊙

Telegraph Lines

THE MATTHEWS-NORTHRUP WORKS, BUFFALO, N.Y.

COPYRIGHT, 1902, BY DODD, MEAD & COMPANY.

The revenue generally falls short of the expenditures, and loans are necessarily resorted to. The budget for 1905 estimated the revenue at 11,715,000 sucres, and the expenditure at 12,238,000 sucres. The public debt is in a state of confusion. Ecuador's share of indebtedness at the dissolution of the Republic of Colombia in 1830 amounted to £1,824,000 ($8,883,000). In 1854 the bondholders finally secured from Ecuador a formal recognition of its debt. In 1867 payment on the debt ceased, and the arrears amounted in 1891 to £428,640. By an arrangement with the creditors in 1892 the principal was reduced to £750,000, which sum was afterwards further reduced. In 1904 the entire foreign debt amounted to 8,566,000 sucres, and is held entirely by the Guayaquil and Quito Railway Company. In 1896 the internal debt amounted to 4,580,000 sucres ($2,275,400). It has increased considerably since then. Ecuador adopted the gold standard in 1900. The silver coinage has been almost entirely superseded by gold, of which there are over 5,000,000 sucres; about four-fifths of this are held by the banks. The Banco del Ecuador and the Banco Comercial y Agrícola, with a combined capital of 3,500,000 sucres, issue notes for circulation, which amount now to about 6,000,000 sucres ($2,922,000). There are two other leading banks.

WEIGHTS AND MEASURES. The unit of value is the peso or sucre, equivalent to 48.7 cents. There are gold condors (10 sucres) and fractions of a sucre in nickel and copper pieces. The metrical system, adopted in 1856, is used only in official publications. The current measures and weights are essentially the same as in the United States. The unit for linear measure is the vara (yard); for weight, libra (pound); for capacity, fanega (4.44 cubic feet).

EDUCATION. Elementary education is gratuitous and obligatory. There are a university at Quito, and a number of secondary schools; the elementary schools number over 1000, and have an attendance of about 70,000. Education is at a low ebb.

POPULATION. The population of Ecuador in 1889 by provinces is given as follows:

Carchi	36,000
Imbabura	67,940
Pichincha	205,000
Leon	109,600
Tunguragua	108,033
Chimborazo	122,200
Cañar	64,014
Azuay	132,400
Loja	66,456
Bolívar	43,000
Rios	32,800
Oro	32,600
Guayas	98,042
Manabi	64,123
Esmeraldas	14,553
Oriente	80,000
Total	1,271,761

In 1897 the population was estimated at 1,400,000. The population of the territory of the Galápagos is given as 400. The whites number about 100,000, those of mixed origin about 400,000, while the remainder consists of Indians and a small number of negroes. The prevailing language of Ecuador is a Peruvian dialect. There are said still to be communities of pure Quichuas. The Cayapas and the Tochi are probably descended from the ancient conquered peoples of Ecuador. The civilized Indians, belonging generally to the Quitus race, form the great laboring class. In the Amazonian valleys several tribes—the Oregones, Encabellados, etc.—are related to those of western Brazil. In the east, too, generally are found the Jivaros, Zaparo, Abiquira, and other peoples who are supposed to be of the Tupi and the Carib races. They were formerly progressive and prosperous, but have greatly deteriorated since the expulsion of the Jesuits in the latter part of the eighteenth century. The Constitution provides that the religion shall be Roman Catholic. Other faiths are rather freely tolerated.

HISTORY. The history of Ecuador up to the coming of the Spaniards is involved in obscurity. Whatever there was among the natives in the way of writings and records which dealt with their earlier experiences the fanatical missionaries converted into ashes. There is, however, among the Indians the tradition that centuries prior to the coming of the Europeans there had existed a strong kingdom in what is now Ecuador, called Quito, which in the tenth century was overthrown by a coast people known as the Caras. The kings of the Caras occupied the throne until 1475, when, after a long and desperate resistance, they succumbed to the Inca armies of Peru, led by Huayna Capac the Great, who added Ecuador to his dominions, establishing his capital at Quito. At his death his territories were divided between his two sons, Huascar, who held Peru, and Atahualpa, who reigned at Quito. They soon fell out, prosecuting war after war against each other, the former being at last overthrown in 1532. It was at this juncture that Pizarro, having, with a handful of men, embarked upon the conquest of the realm of the Incas, arrived on the scene. He seized Atahualpa at Cajamarca, and in 1533 he put him to death. The vast territories of the unfortunate Inca were added to the Spanish Empire. They were erected into a presidency, with Quito as capital, and subordinate to the Viceroy of Peru. It remained thus until the outbreak of the great revolution which freed South America from Spanish rule.

The defeat of the Spaniards in the battle of Pichincha, in 1822, liberated the Province of Quito, which now constituted part of the Republic of Colombia, organized under the auspices of Bolivar. In 1829 Venezuela withdrew from the confederation, and in 1830 the independent Republic of Ecuador was constituted. Then there followed a number of struggles between rival political leaders, of whom the chief were Flores and Rocafuerte, which demoralized the country, destroying all security of person and fortunes. The Ecuadorians, however, were not content with fighting among themselves—they interspersed their local outbreaks with wars against their neighbors, Peru and Colombia. In 1845 Vicente Roca became President, and one of the distinguishing acts of his régime was the convention with England for the abolition of slavery.

From 1850 the struggle between the Clerical and Liberal parties became bitter. In that year Diego Noboa, of the Clerical Party, having seized the Presidency, was overthrown by the Liberals under General Urbino. The power rested with the latter party till 1860, when there occurred a general breaking up, with several leaders claiming the Presidency. The Clericals finally triumphed under Moreno. The latter was assassinated in 1875. In 1895-96 a new civil war broke out between the two parties, resulting in a Liberal triumph. General Alfaro became President, and since that time the situation of the country has improved. A Clerical uprising in 1899 led to troubles with Colombia; but a new Liberal President in the person of General Plaza was peacefully inaugurated August 31, 1901. He was succeeded in 1905 by Lizardo Garcia who was overthrown in January, 1906, by ex-President Alfaro.

Bibliography. Cevallos, *Geografía del Ecuador* (Lima, 1888); Child, *The Spanish-American Republics* (New York, 1891); Wolf, *Geografía y geología del Ecuador* (Leipzig, 1892); id., *Viages científicos por la república del Ecuador* (Guayaquil, 1879); Wappäus, "Ecuador," in Stein, *Handbuch der Geographie* (Leipzig, 1871); Reiss and Stübel, *Hochgebirge der Republik Ecuador* (Berlin, 1892-98); Monnier, *Des Andes au Pará* (Paris, 1890); Whymper, *Travels Amongst the Great Andes of the Equator* (London, 1892); Kolberg, *Nach Ecuador* (Freiburg, 1897); Cevallos, *Resumé de la historia del Ecuador* (Guayaquil, 1886); Dawson, *South American Republics* (New York, 1904).

EC′ZEMA (Neo-Lat., from Gk. *ἔκζεμα*, *ekzema*, skin-disease, from *ἐκζεῖν*, *ekzein*, to boil out, from *ἐκ*, *ek*, out + *ζεῖν*, *zein*, to boil). An inflammatory disease of the skin characterized by a number of cutaneous lesions, such as macules, papules, pustules, vesicles, scales, and crusts, generally with exudation of serum and intense itching. It is the commonest skin-disease, and represents from one-half to one-third of all cutaneous affections. It may be acute or chronic in its course. It is divided into four elementary types: erythematous, papular, vesicular, and pustular; but there are several secondary types, such as squamosum, rubrum, parasiticum, seborrhœicum, marginatum, neuroticum, diabeticorum, intertrigo, fissum, verrucosum, and sclerosum. Among internal causes of eczema are alcoholic beverages, dietetic errors, medicines, visceral disorders, gout, scrofula, and neurasthenia. From the belief that a 'humor of the blood' caused eczema, it has been commonly called 'salt rheum.' Among external causes are scratching, heat, cold, friction, and pressure, acids and poisons, and animal and vegetable parasites. Treatment must be directed to the particular form of the disease. In all cases strict dietetic and hygienic rules must be followed, causes must be removed or treated with a view to removal; laxatives, iron tonics, bitter principles, and electricity are used. Locally, antiseptic powders, zinc, salicylic acid, permanganate of potash, tar, ichthyol, thymol, oil of cade, bismuth, mercury, lead, carbolic acid, sulphur, and green soap are among the drugs used. Each case must be intelligently studied if treatment is to succeed.

EDAM, *Dutch pron.* ā-däm′. A town of the Netherlands in the Province of North Holland, 12 miles north-northeast of Amsterdam (Map: Netherlands, D 2). One of its Reformed churches, with large painted windows, is among the finest in North Holland. The town is chiefly known through its cheeses and its cheese fair. Other industries are ship-building, rope and sail making. Population, in 1891, 6424; in 1899, 6444.

EDAM CHEESE. See Cheese; Cheese-Making.

EDAPH′IC (from Gk. *ἔδαφος*, *edaphos*, foundation, soil). In botany, edaphic influences are those that are local, especially those that reside in the soil. This term is opposed to climatic, e.g. a cypress swamp is an edaphic, and a desert is a climatic area. See Ecology; Distribution of Plants.

ED′DA. A title applied to two distinct works in Scandinavian literature, the *Edda of Sæmund the Wise*, and the *Edda of Snorri Sturluson.* They are also called respectively the Poetical and the Prose, and the Elder and the Younger Edda. The latter of these, to which alone the name Edda is properly applied, treats of Scandinavian mythology and of the language and modes of composition of the ancient skalds (q.v.). Its original purpose was to serve as a guide for young poets. Accompanying this Edda are four grammatical treatises, which are frequently included in modern editions. They have also been published separately, with critical introductions and notes (Copenhagen, 1884-86). As its second name implies, the Prose Edda is ascribed to the Norse historian and politician Snorri Sturluson (q.v.), who flourished in the first half of the thirteenth century. Originally it consisted of three main parts: (1) *Gylfaginning* (the deception of Gylfi), in which various exploits of the gods and goddesses are related to a mythical Swedish king Gylfi, who is supposed to visit Asgard; (2) *Skaldskaparmál* (the language of poetry), in which an explanation is given of many of the figures of speech used by the skalds; (3) *Háttatal* (list of metres), a catalogue of the different kinds of metres used by the skalds. Snorri's treatment of the mythology is often inaccurate, and is not free from contradictions. This is, however, in spite of its evident faults, one of the most important monuments of Old Norse literature. The Prose Edda was first published by Resenius in Copenhagen in 1665. This edition includes a translation into Latin by the editor and others. The next edition was published in Sweden (1746). The first modern critical edition is that of Rask, published at Stockholm in 1817. The most complete modern edition is the Arna-Magnæan (Copenhagen, 1848-87), in three volumes, with a Latin translation and notes. Finnur Jónsson has edited both the Eddas, with German notes (1880-90). E. Wilken's *Die Prosaische Edda im Auszuge* (1877-82) contains the first two parts, with a German glossary. The standard German translation is Simrock's (1851). The *Gylfaginning* was translated into French by Bergmann (2d ed. 1871). The mythological part has been translated into English by Dasent (1842), and by Blackwell (in Mallet's *Northern Antiquities*). R. B. Anderson's version (1880) includes the narrative portion of the *Poetical Diction*, and several minor parts.

The *Elder Edda* is a collection of mythological and heroic Scandinavian songs, thirty-three in all, the date of whose composition in their present form may probably be referred to different periods between the tenth and the thirteenth centuries. The view that assigns to them a great antiquity is no longer held by scholars. The arrangement of the whole is very unsystematic, and the text is in many parts corrupt.

Vigfússon, in the *Corpus Poeticum Boreale*, vol. i. (1883), tried to rearrange the parts, but his attempt is regarded as ingenious rather than convincing. These songs, which were discovered and first brought to the notice of European scholars in 1643 by Brynjólf Sveinsson, Bishop of Skalholt, in Iceland, were incorrectly supposed by him to be the work of Sæmund the Wise (1055-1132). His application to them of the name Edda is also improper, as that title, which probably means poetic guide, belongs only to the prose work. The etymology of the word that connects it with *great-grandmother* is no longer taken seriously. The unique MS. in which the Elder Edda is contained is called the *Codex Regius*, and is lodged in the Royal Library at Copenhagen. A splendid lithographic facsimile edition, with a diplomatic text, was issued in 1891 under the editorship of Wimmer and Jónsson. A facsimile of a fragment of another MS. of the Edda was published five years later by Jónsson. The collection was first published entire at Stockholm in 1818 by A. A. Afzelius, and at Copenhagen by the Arna-Magnæan Commission in 1777-1828, with a Latin translation, glossaries, etc. Complete editions were also published by Munch (1847), Lüning (1859), Möbius (1860), and Svend Grundtvig (1867). But all former editions have been superseded by that of Sophus Bugge (1867). Hildebrand's edition (1876) is accompanied by a valuable glossary by H. Gering (2d ed. 1896). In German, the best rendering is Simrock's. Both Ettmüller and the brothers Grimm have translated portions. The latest German version is H. Gering's (1892). A Danish rendering of the mythical lays by Karl Gjellerup was issued in an illustrated edition in 1895. The standard Danish translation is Müller's (1871). There is a French rendering by E. de Laveleye (1866). The earliest English translation is Cottle's (1767). A complete English translation by Ben Thorpe was published in 1866. Several of the lays are translated by R. B. Anderson, in his *Northern Mythology* (1875). In the *Corpus Poeticum* an English rendering is given by F. Yorke Powell, in which the arrangement of Vigfússon's text is followed.

For a discussion of the question of the possible non-Scandinavian origin of the Elder Edda, consult Bugge, *Home of the Eddic Lays*, translated by Schofield (London, 1899). See, also, SCANDINAVIAN AND TEUTONIC MYTHOLOGY.

ED'DOES. See COCCO.

ED'DY, CLARENCE (1851—). An American organist and composer, born at Greenfield, Mass. He studied under Dudley Buck in Hartford, counterpoint under Haupt, and piano under Loeschhorn in Berlin. In 1894 he was made organist of the First Congregational Church in Chicago, where he had been director of the Hershey School of Musical Art since 1876. Mr. Eddy's series of 100 organ recitals, with entirely different programmes, given in 1877-79, is one of the most memorable achievements in the history of American music. He has composed organ music, translated Haupt's *Counterpoint, Fugue, and Double Counterpoint* (1876), and published *The Church and Concert Organist* (1882-85), *The Organ in Church* (1887), etc.

EDDY, HENRY TURNER (1844—). An American scientist, born at Stoughton, Mass. He was educated at Yale University and Sheffield Scientific School, and later took a further scientific course in Berlin and Paris. After holding a professorship in mathematics, astronomy, and civil engineering at the University of Cincinnati (1874-90), and acting as dean of the academic faculty of that institution (1874-77, 1884-89), he became its president in 1890. He was also president of the Rose Polytechnic Institute at Terre Haute, Ind., from 1891 to 1894, when he accepted the chair of engineering and mechanics at the University of Minnesota. His works include: *Analytical Geometry* (1874); *Researches in Graphical Statics* (1878); *Thermodynamics* (1879); *Neue Constructionen aus der graphischen Statik* (1880); and *Maximum Stresses Under Concentrated Loads* (1890).

EDDY, MARY BAKER GLOVER (c.1822—). The founder of the Christian Scientist denomination. She was born at Bow, near Concord, N. H. When a comparatively young woman, she removed to the South and married Col. George W. Glover, of Charleston, S. C., with whom she lived in that city. In 1877 she married Dr. Asa G. Eddy. Mrs. Eddy gives 1866 as the date of her discovery of Christian Science. She founded the first Christian Science Church at Boston in 1879, and opened the Massachusetts Metaphysical College there in 1881. She frequently appeared upon the lecture platform, and wrote much for the Christian Science publications, but is most widely known as the author of *Science and Health, with Key to the Scriptures*. The first edition of this work was published in 1875, and since then it has been reprinted, with various modifications in its wording, to the number of more than a quarter of a million copies. It sets forth the Christian Scientists' interpretation of the Holy Scriptures and their understanding of the religion of Christ. Christian Scientists believe that living in strict accord with its teaching will improve the moral and spiritual condition of its adherents, and consequently their physical condition. Some of Mrs. Eddy's other publications are: *People's Idea of God* (1886); *Christian Healing* (1886); *Retrospection and Introspection* (1891); *Unity of Good* (1891); *Rudimental Divine Science* (1891); *No and Yes* (1891); *Manual* (1895); *Miscellaneous Writings* (1896); *Christ and Christmas* (1897); *Christian Science versus Pantheism* (1898); *Pulpit and Press* (1898); and *Message to the Mother Church* (1900, 1901, 1902). See CHRISTIAN SCIENCE.

EDDY, RICHARD (1828—). An American Universalist clergyman. He was born at Providence, R. I., June 21, 1828. He entered the ministry in 1821. During the Civil War he was chaplain of the Sixtieth New York Volunteers, and has written a history of the regiment. Since 1877 he has been president of the Universalist Historical Society, and since 1887 editor of the *Universalist Register*. He has published: *History of Universalism in America, 1636-1886* (1884-86); *Alcohol in History* (1887); *Universalism in Gloucester, Mass.* (1892); *History of Universalism,* A.D. *120-1890* (1894); *Life of Thomas J. Sawyer, D.D., and Caroline M. Sawyer* (1900).

EDDY CURRENTS. See FOUCAULT CURRENTS.

ED'DYSTONE. See LIGHTHOUSE.

EDELFELT, ā′del-fĕlt, Albert Gustav Aristed (1854—). A Finnish painter, born at Helsingfors. He studied at the Academy of Fine Arts in Antwerp, and then under Gérôme in Paris. His work includes studies of the life and scenery in his native country; two of these are in the Luxembourg, "Divine Service on the Seashore" (1882), and "A December Day in Finland." He is also known as a water-color and pastel artist. He received a second-class medal in 1882.

EDELMANN, ā′del-män, Johann Christian (1698-1767). A German rationalist, born at Weissenfels. He studied theology at the University of Jena, resided for a time with Count Zinzendorf at Herrnhut, and participated in the translation of the Berleburg Bible. Soon after he turned weaver, donned a Mennonist smock-frock, and continued authorship only at the request and with the support of interested friends. Having come to Neuwied, he was there compelled by the Count to draw up a confession of faith; and when this was printed, without his consent and in a garbled version, he retorted by publishing the true copy with annotations as an *Abgenötigtes, jedoch andern nicht wieder aufgenötigtes Glaubensbekenntnis* (1746). Persecuted as a free-thinker, he fled to Altona, where he lived in concealment, not venturing into Hamburg by day for fear of the derision of the workmen from the cordage factories. In 1749 he went to Berlin, where Frederick II., though forbidding him to publish further, tolerated him, on the ground, it is said, that fools had to be endured. He was described as a choleric and laborious person. He was among the first German opponents of positive religion, which he denounced as superstition. His views were not new, but were proclaimed with a blasphemous emphasis which attracted brief attention. Among his other works are *Moses mit aufgedecktem Angesicht* (1740), and *Die Göttlichkeit der Vernunft* (1742). An autobiography, edited by Klose, appeared in Berlin in 1849.

EDELWEISS, ā′del-vīs (Ger., noble white, from *edel*, noble + *weiss*, white), *Leontopodium alpinum*. An alpine perennial woolly plant of the composite family, found in Switzerland, the Tyrol, Carinthia, Alpine Austria, and Siberia. It bears heads of flowers surrounded by woolly bracts and sage-green leaves. It is famous, not for its beauty, but because of its scarcity, and the difficulty of obtaining it in its elevated haunts, and is so rare in Switzerland that several cantons protect it by law. It is readily cultivated in gardens in America and Europe. In Swiss poetry and legend it plays a prominent part.

EDEMA. See Œdema.

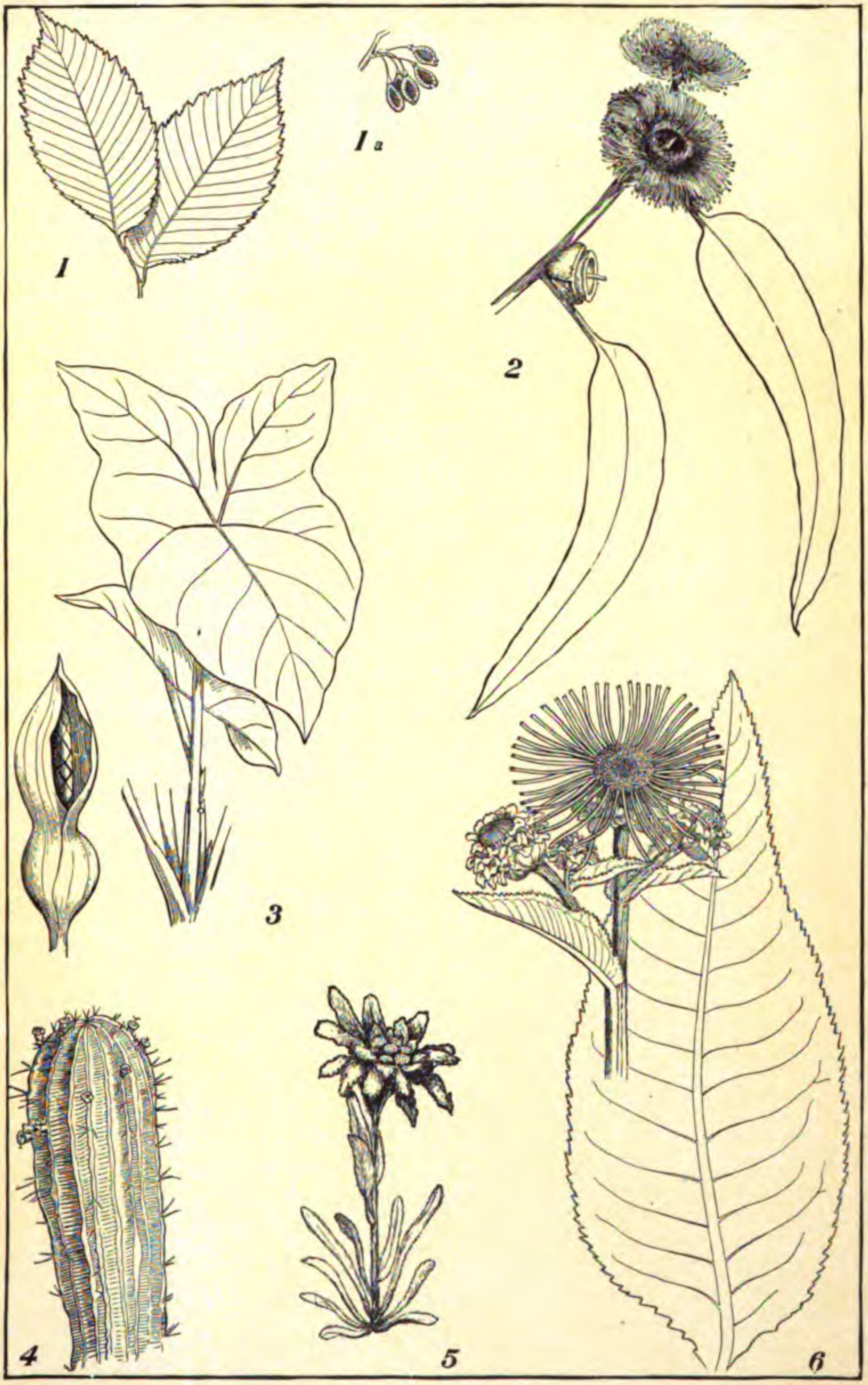
E′DEN (Heb., *'ēden*, delight). According to the biblical account, the first residence of man. On the supposition that the narrative in Genesis describes a real country, endless views have been brought forward in regard to the situation of Eden. Josephus and several of the Fathers conceived that Eden was a term denoting the entire region between the Ganges and Nile. Calvin, Huet, Bockart, Wells, and others, have, with slight differences of detail, decided in favor of Kornah in Babylonia, not far from the Persian Gulf; Reland, Calmet, Hales, Faber, J. Pye Smith, in favor of Armenia, near the sources of the Tigris and Euphrates; Le Clerc, in favor of the region near Damascus, while even Australia and the North Pole have been advocated. The description in Genesis (ch. ii.) points unquestionably to southern Babylonia. but the geographical notions of the writer are confused, and he has complicated his description of Eden by introducing mythological conceptions, found among other peoples, of a great river which forms the source of all the larger streams. He knows of four such streams, the Tigris, Euphrates, Gihon, and Pishon. He is well acquainted with the first two, but has only hazy notions of the latter. It is quite likely that he intended the Gihon for the Nile, as Josephus already has it (Ant. i. 1-3), and if it be recalled that many centuries later Arabic geographers supposed the Nile to have its rise in India, it is not strange to find a writer of the seventh century B.C. placing the source of the Nile in Babylonia. The Pishon, which 'encompasses' the land of Havilah, i.e. southern Arabia, may be after all, as seems most natural, the Arabian Sea; and since the Persian Gulf is in cuneiform inscriptions called a 'river,' it is not improbable that a writer who had only heard of southern Arabia should call the body of water flowing around it a river. However that may be, the original habitat of man for the biblical writer is in the same region in which mankind dwells before the dispersion. It has been supposed that *Edinnu* was the 'Sumerian' name of the plain of Babylon, but this is doubtful, though the identification of Eden with *Edinnu* may be admitted. Of the vast literature on Eden, but little is of value at present. It will be sufficient to refer to Delitzsch's work *Wo lag das Paradies?* (1881), although his theory of the identification of Gihon and Pishon with two of the canals of Babylonia is not tenable. See also the Commentaries on Genesis by Dillmann, Holzinger, Strack, and more particularly that of Gunkel (1900).

EDEN. The name of an American town in Dickens's *Martin Chuzzlewit*. From speculators in the East, young Martin and Mark Tapley buy land in Eden, which is represented to them as a flourishing business centre. When they reach it, however, they find only a malarious swamp.

EDEN, George. See Auckland, George Eden, Earl of.

EDEN, Sir Robert (1741-84). An English baronet, the last proprietary Governor of Maryland. He was the second son of Robert Eden, of Winderstone Hall, Durham. The eldest brother inherited the baronetcy and seat in Parliament; two brothers raised themselves to the peerage as Lord Auckland and Lord Henley; another became auditor of Greenwich Hospital, and was the father of an admiral and a lieutenant-general, and a sister married Archbishop Moore, of Canterbury. Before he was sixteen, Robert obtained a commission in the Royal Regiment of Artillery; in 1758 he was raised from cadet to ensign in the Coldstream Guards, and in 1762 he was promoted captain. He served in Germany during the Seven Years' War, and soon after returning to England married the sister of Frederick, the sixth and last Lord Baltimore. His appointment as Governor of Maryland in 1768 was due to his family connection; but after his arrival in June, 1769, he displayed tact and ability in the stormy times which he came upon, and endeared

EDELWEISS, ETC.



1. ELM LEAF (Ulmus Americana).
1a. FRUIT, of the same Elm.
2. BLUE GUM SPRAY (Eucalyptus globulus).
3. CALADIUM or ELEPHANT'S EAR (Caladium bicolor) and spathe.
4. AN AFRICAN EUPHORBIA (Euphorbia officinarum).
5. EDELWEISS (Leontopodium Alpinum).
6. ELECAMPANE (Inula helenium).

himself to the people by his prudence and kindliness. The most serious controversy in which he held out against the people was that over the fees of public officers. In a proclamation of November 24, 1770, he asserted that it was his prerogative to settle such fees, and although he maintained his position until the institution of the Provisional Government, the colonists blamed only his advisers without becoming embittered against him. The death of Lord Baltimore in September, 1771, undermined the Proprietary Government, for the loyalty of the colonists did not extend to the illegitimate son, Henry Harford, who became the next proprietary, and during the absence of their Governor, who went home to act as an executor of his brother-in-law's estate, great advances were made toward independence. He remained in the colony until June 23, 1776, when, Maryland having definitely committed herself to the principles of the Revolution, and having virtually declared the Proprietary Government at an end, he embarked on a British war-vessel. During his term as Governor he had assumed the rôle of apologist for the colony, and had believed in its loyalty to the end. He returned to Maryland in 1784, and died in Annapolis, on September 2d of that year. Consult: Steiner, "Life and Administration of Sir Robert Eden," in the *Johns Hopkins University Studies in Historical and Political Science,* Sixteenth Series, Nos. vii.-ix. (Baltimore, 1898).

EDEN, William. See Auckland, Baron.

EDEN HALL, Luck of. See Luck of Eden Hall.

E'DENTA'TA, or **BRU'TA** (Lat. nom. pl., toothless, from *e,* out + *dens,* tooth). An order of Mammalia, established by Cuvier, who remarked that, although brought together by a purely negative character, the Edentata have, nevertheless, some positive mutual relations, particularly in the great claws which approximate to the nature of hoofs; also in a certain slowness or want of agility, obviously arising from the peculiar organization of their limbs. He included among them, however, the monotremes, now entirely separated. The ant-eaters and pangolins are the only Edentata that are absolutely destitute of teeth; but none of the order have any teeth in the fore part of their jaws, and their teeth are comparatively imperfect in structure, being destitute of enamel and distinct roots; they grow from a distinct pulp, are all alike, and (except in Tatusia) are not preceded by a set of milk-teeth. The sloths alone subsist on vegetable food, the rest chiefly on insects or on animal substances in a decaying state. The Edentata form one of the smallest orders of mammals; its headquarters are in South America, but some species are found in Africa and southern Asia. All are clothed with coarse hair, which in the sloths and ant-eaters completely covers the body; in the pangolins is united into overlapping plates or scales; and in the armadillos is very sparsely scattered over the body, which is otherwise protected by dermal plates. The Edentata are generally ranked as the lowest of the placental mammals, not merely because of the condition of the teeth, but because the brain is small and poorly developed, the cerebrum not nearly covering the cerebellum, and being perfectly smooth. The order is generally grouped in five tribes or suborders, the sloths (Tardigrada), which are characteristic of South America; the pangolins (Squamata), found only in Asia and Africa; the armadillos (Loricata), found from Texas southward in America; the true ant-eaters (Vermilinguia), found only in South America; and the aard-varks (Fodientia), found only in South Africa. No living Edentata are known in Europe. Consult: Rapp, *Anatomie Untersuchungen über die Edentata* (2d ed., Berlin, 1852); Flower, "Mutual Affinities of the Edentata," in *Proceedings Zoölogical Society of London* (London, 1882); Thomas, "A Milk Dentition in Orycteropus," in *Proceedings Royal Society of London,* vol. xlvii. (London, 1890); Beddard, *Mammalia* (London, 1902); also authorities referred to under the various groups, as Sloth, etc. See Plate of Ant-Eaters.

Fossil Edentata. Remains of fossil edentates have been found rarely in the Tertiaries of Europe and Africa. The centre of greatest development seems to have been South America, during ancient times as well as at present, though some imperfectly known forms, more nearly like the normal mammals in dentition, having incisor teeth on both jaws and the normal premolar and molar teeth, have been discovered in the Eocene deposits of North America. The paleontologic evidence does not support the hypothesis that the edentates represent primitive forms of mammals, but it does show that they have been derived by regressive evolution from higher normal eutherian types, and that they constitute a degenerate series of mammals, the exact origin of which is, however, unknown. See Degeneration as a Factor in Evolution; and Extinction of Species.

No fossil form of the sloths (family Bradypodidæ) or ant-eaters (Myrmecophagidæ) have been found, but an extinct family (Megatheriidæ) presents characters intermediate between these two modern groups. They were mostly mammals of gigantic size, such as Megatherium, Mylodon (qq.v.), Scelidotherium, and Megalonyx, the remains of which are found commonly in the Pleistocene deposits of South America, and occasionally in the Pleistocene cave deposits of North America, as far north as Kentucky. The armored edentates, such as the armadillos and glyptodonts, are connected with the megatheriums through Megalonyx, which has ossified plates imbedded in its skin. These isolated plates became united into transverse rows in the armadillos and into a solid carapace in the glyptodonts. The gigantic glyptodon (q.v.) and the allied Dædicurus, from the Pleistocene beds of Argentina, have the body inclosed in a solid massive carapace made of polygonal bony plates that are firmly soldered together in the adult animals, but loosely joined in the young individuals. The tail also is covered by heavy plates. The total length of the skeleton varies from twelve to twenty feet. Armadillos with movable transverse rows of dermal plates are found fossil in the Tertiary deposits of Patagonia, and the earliest forms show no close points of relationship with the glyptodonts. The genera are Chlamydotherium, Dasypus, Eutatus, and Proëutatus, of which the first mentioned attained the bulk of a rhinoceros. Compare Ganodonta.

Bibliography. A. S. Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898); Nicholson and Lydekker, *Manual of Paleontology* (Edinburgh, 1889); Ameghino, *Enumération* *synoptique des espèces de mammifères fossiles des formations éocènes de Patagonie* (Buenos Ayres, 1894); Marsh, "The Stylinodontia, a Suborder of Eocene Edentates," *American Journal of Science*, ser. 4, vol. iii. (New Haven, 1897).

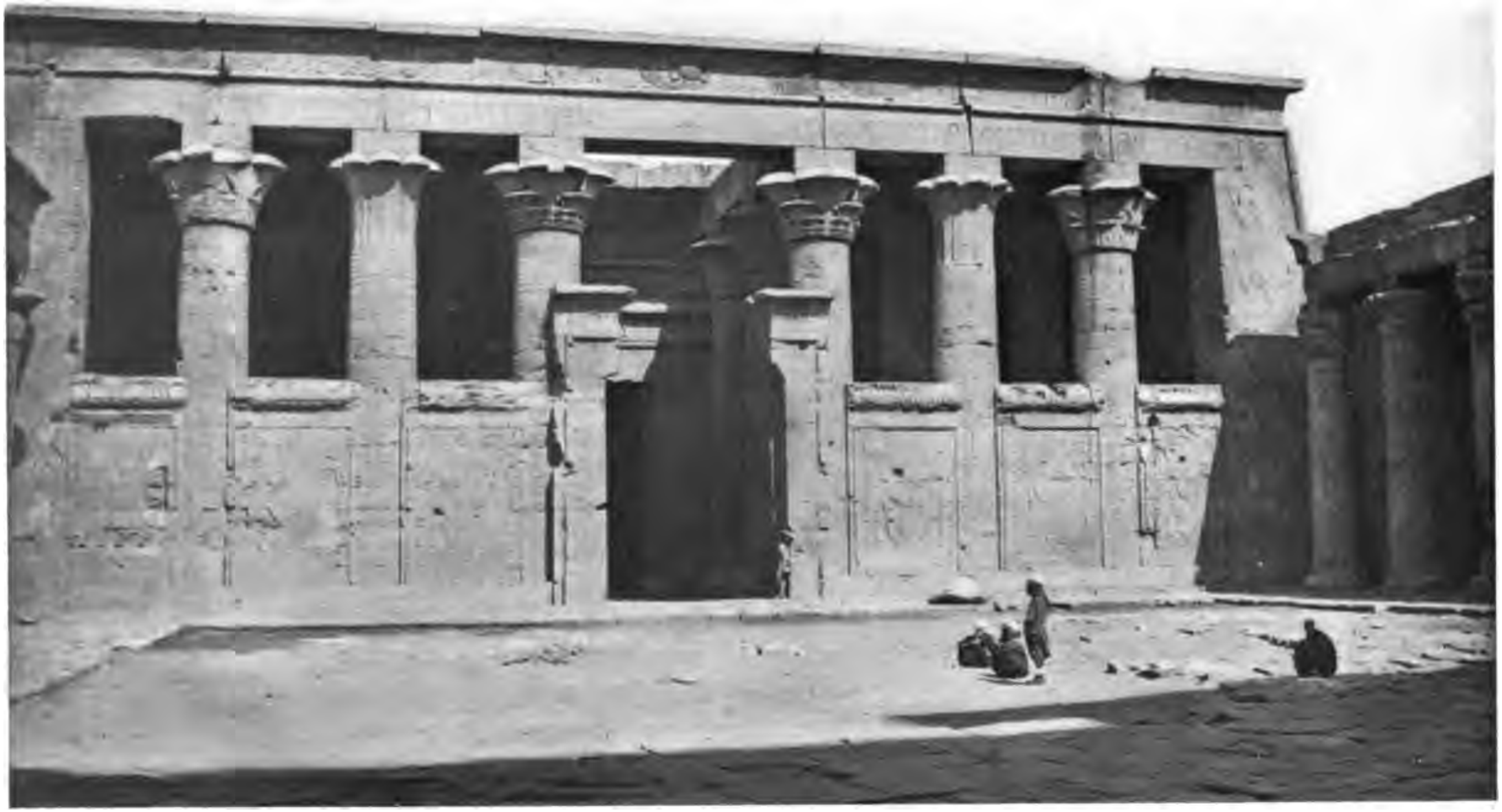
E'DENTON. A town, formerly a port of entry, and the county-seat of Chowan County, N. C., 115 miles (direct) east by north of Raleigh; on Albemarle Sound, and on the Norfolk and Southern, and the Virginia and Carolina Coast railroads (Map: North Carolina, F 1). It has extensive herring and shad fisheries and considerable lumber interests. Pop., in 1900, 3046. Founded in 1712, Edenton was originally known as Queen Anne's Creek, and received its present name in honor of Charles Eden, an early Colonial Governor. Here was held, on October 24, 1774, the famous Edenton Tea Party, at which fifty-two women formally voted that they would not conform "to that Pernicious Custom of Drinking Tea," and "would not promote ye weare of any manufacture from England."

EDER, ā'dēr, JOSEPH MARIA (1855—). An Austrian chemist. He was born at Krems, and was educated at the university and at the Polytechnic Institute of Vienna. In 1882 he was appointed professor of chemistry at the State Industrial School in that city, and afterwards assisted in the organization of the Imperial Educational and Experimental Institute for Photography, of which he was appointed director in 1888. Especially noteworthy are his investigations on the influence of light of various wavelengths upon silver salts, which resulted in the development of orthochromatic photography. He also invented a new photometric method and the now extensively used 'aristo papers' (chloro-gelatin papers). His publications include *Die Momentphotographie in ihrer Anwendung auf Kunst und Wissenschaft* (2d ed., 1886 and 1888); *Anleitung zur Herstellung von Momentphotographien* (2d ed. 1887); *Photographie mit Bromsilbergelatine* (4th ed. 1890); *Versuch über Photographie mittels der Röntgenschen Strahlen* (with Valenta, 1896), and *Densitometrie photographischer Trockenplatten* (1900). He has been since 1887 the editor of the *Jahrbuch für Photographie und Reproduktionstechnik* (Halle, annually).

EDERSHEIM, ā'dērs-hīm, ALFRED (1825-89). An English biblical scholar. He was born in Vienna, of Jewish extraction, and was educated at the university in that city. Unable to complete his university education because of financial obstacles, he accepted a tutorship in Pest, where he embraced Christianity. After studying theology in Edinburgh and Berlin, he was ordained to the Presbyterian ministry (1846), and soon afterwards received an appointment to the Free Church, Aberdeen, with which he remained associated for twelve years. He subsequently became select preacher to the University of Oxford (1884-85) and Grinfield lecturer on the Septuagint (1886-88, 1888-90). His principal work is entitled *The Life and Times of Jesus the Messiah* (1883), and he also published works entitled *Bible History* (of the Old Testament, 7 vols. 1876-87), and *Jewish Social Life in the Time of Christ* (1879).

EDES'SA (Lat., from Gk. Ἔδεσσα). The ancient capital of Macedonia, formerly known as Ægæ. It was situated 46 miles west of Thessalonica, at the head of a defile commanding the approaches from the seacoast to the interior. It was the original residence of the Macedonian kings, and was the burial-place of the royal family long after it ceased to be the seat of government. In Edessa Philip II. was murdered by Pausanias, B.C. 336. Alexander the Great (q.v.) was buried at Alexandria, but Edessa remained the royal burial-place, and when Pyrrhus occupied the place the royal tombs were plundered by his Gallic mercenaries. In Roman times Edessa was an important post on the great road from Dyrrhachium to Thessalonica. The modern city of Vodena is built on the site of Edessa, and only scanty remains of the ancient buildings are preserved.

EDESSA, or CALLIRRHOË (modern name *Urfah*, or *Orfa*). A very ancient city on the river Daisan, in the north of Mesopotamia (in the modern Vilayet of Aleppo), 78 miles southwest of Diarbekir. Though the town is of very early origin, it is with the conquest of Persia by the Greeks that the history of Edessa first becomes clearer. Seleucus, in particular, is said to have done much for the aggrandizement of the city, and its prosperity increased under an independent line of kings reigning just before and after the Christian Era. Christianity was introduced into Edessa at an early period, and the supposed relations of King Abgarus and Christ are embodied in the famous letter found in Edessa by Eusebius at the beginning of the fourth century. In the reign of Trajan the place was made tributary to Rome, and in A.D. 216 became a Roman military colony under the name of Colonia Marcia Edessenorum. It was, with Nisibis, Damascus, and Antioch, one of the four greatest cities of Syria. During this period its importance in the history of the Christian Church continued to increase. More than three hundred monasteries are said to have been included within its walls; it was the birthplace of Saint Ephraim Syrus, the principal centre of Syrian learning and literature during the fourth, fifth, and sixth centuries, and played an important part in the Arian and other controversies. Its famous university or school of the Persians was closed on account of heretical tendencies by the Emperor Zeno toward the end of the fifth century. With the extension of the religion of Islam Edessa fell into the hands of the Arabian caliphs. Christianity declined, and wars at home and abroad during the caliphate destroyed likewise its temporal splendor and prosperity, till, in 1040, it fell into the possession of the Seljuk Turks. The Byzantine emperors succeeded in recovering Edessa, but the viceroy contrived to make himself independent. He was, however, hard pressed by the Turks, and this rendered it easy for the Crusader Baldwin, the brother of Godfrey of Bouillon, to gain possession of the city (1097 A.D.), and make it the capital of a Latin principality, and the bulwark of the kingdom of Jerusalem. Under the Frankish princes, Edessa held out valiantly against the Mussulmans, till at length Zengi, ruler of Mosul, succeeded in taking the town and citadel in the year 1144, when all the Christian churches were converted into mosques. An attempt made by the inhabitants to throw off the Mohammedan yoke completed the ruin of Edessa. Its inhabitants were defeated by Nur-ed-Din, and



EDFU
TEMPLE OF HORUS
THE GREAT COURT, AND THE ENTRANCE TO THE HYPOSTYLE HALL

all who were not massacred were sold as slaves. After many vicissitudes, in the course of which Edessa fell successively into the hands of the sultans of Egypt, the Byzantines, the Mongols, Turkomans, and Persians, the city was finally conquered by the Turks, and has since formed a portion of the Turkish dominions. On its site stands the modern city of Orfa or Urfah, with a population estimated at from 20,000 to 55,000, mostly Mohammedans. The modern city has numerous mosques and bazaars; manufactures of cotton goods, goldsmiths' wares, and morocco leather, commerce in British manufactures obtained by way of Aleppo, and a large trade in corn, etc., with Syria. It is regarded by the Orientals as a sacred city, because they believe it to have been the residence of Abraham.

EDFU, ĕd′fōō (Coptic *Atbô*). A town of Upper Egypt, on the left bank of the Nile (latitude 25° 1′ north, longitude 32° 16′ east), about 60 miles above Thebes. The chief local deity was Horus (q.v.), whom the Greeks identified with Apollo, and for this reason called the place Apollinopolis. As *Apollinopolis Magna* it was distinguished from *Apollinopolis Parva* (the modern Qûs), the seat of worship of the god Haroëris (q.v.). Edfu was celebrated in Egyptian mythology as the scene of one of the great contests between Horus and Set. The legend is given in full in Wiedemann's *Religion of the Ancient Egyptians* (1897). The great temple of Horus at Edfu, which stands to-day almost intact, is in a better state of preservation than any other Egyptian temple. It was begun on the site of an older temple in B.C. 237, under the reign of Ptolemy III. (Euergetes I.), and was completed and dedicated under Euergetes II. about a century later. Considerable additions were made to it by later monarchs down to the year B.C. 57. Including the court, it is some 451 feet in length and its façade is 250 feet wide. A gateway, 50 feet high, between two immense pylons, over 100 feet in height and covered with inscriptions, gives entrance to a splendid court (161×140 feet) inclosed by a double colonnade of 32 pillars, each of a different design. At the upper end of the court is the great portico, its roof supported by eighteen pillars, and then comes a hypostyle hall of 12 pillars. This gives access to two successive vestibules leading to the sanctuary, which is surrounded by an open corridor. A number of chambers, ranged along the wall of the temple, open into this corridor. From the pylons extends the outer wall which incloses the court and all the temple buildings in a single great quadrangle. The principal buildings are richly decorated with sculptures and paintings, and contain numerous inscriptions, chiefly of a religious or mythological character. Both the court and the temple were formerly nearly covered up with rubbish, and Arab hovels were built against the walls and even upon the roof; but early in the sixties Mariette, by permission of the Khedive, cleared away the débris and removed the wretched buildings which encroached upon the temple.

The so-called Birth House, built by Euergetes II. and decorated by Soter II., stands near the entrance of the great temple of Horus. It is surrounded by a gallery whose roof is supported by pillars adorned with figures of the god Bes. Consult: Lepsius, *Briefe aus Aegypten, Aethiopien, etc.* (Berlin, 1852); Brugsch, *Reiseberichte aus Aegypten* (Leipzig, 1855); Mariette, *Monuments of Upper Egypt* (London, 1877).

EDGAR or **EADGAR,** ĕd′gẽr (944-975). A king of the English, called Edgar the Peaceful. He was a son of Eadward or Edmund the Magnificent. In 957 he became a ruler of Northumbria and Mercia, and on the death of his brother Edwy or Eadwig in 958 he was called to the throne by the entire people, succeeding to the Kingdom of the West Saxons in addition to that which he already controlled. During his reign of seventeen years he had for his chief adviser the able Dunstan, Archbishop of Canterbury. He brought about the establishment of national consolidation, the reformation of the clergy, the improvement of the judiciary system, and the formation of a fleet to defend the coast against the Norsemen.

EDGAR. The son of the Earl of Gloster, in Shakespeare's *King Lear*, whose ill-treatment, wanderings, feigned madness, and sweet forgiveness of his unjustly suspicious father form the secondary plot of the play.

EDGAR, JAMES DAVID (1841-99). A Canadian legislator and author, born in Quebec. He served in Parliament from 1872 to 1874, and was reëlected in 1884, 1887, and 1891. In 1889 he was instrumental in securing the passage of the Canadian Copyright Act. He was Speaker of the Commons (1896), and in 1897 became a member of the Queen's Privy Council. In addition to his contributions to the daily press, he published a volume of poems, *This Canada of Ours, and Other Poems* (1893), and *The Insolvent Act of 1864* (1865).

EDGAR ATH′ELING, or **EADGAR THE AETHELING** (c.1057-c.1120). An English prince, a grandson of Edmund Ironside. He was born in Hungary, whither his father had been exiled by Canute. After the death of Edward the Confessor, Edgar was the nearest heir to the crown, which passed, however, to Harold, from whom it was wrested by William the Conqueror. Edgar's life was a succession of fruitless struggles, his most noteworthy achievement being his expedition into Scotland (1097) for the purpose of reinstating his nephew Edgar as king of that country. In 1099 he engaged in the Crusade, and returned to England during the reign of Henry I.

ED′GARTOWN. A town, port of entry, and county-seat of Dukes County, Mass., on the eastern shore of the island of Martha's Vineyard, 27 miles (direct) southeast of New Bedford (Map: Massachusetts, F 5). It has a small but well-sheltered harbor, and was formerly a whaling port. At present it is known chiefly as a summer resort. Edgartown was founded in 1642 and was incorporated in 1671. Its government is administered by a board of selectmen elected at the annual town meeting. Population, in 1900, 1209; in 1905, 1174.

EDGE′HILL. A hill ridge in Warwickshire, England, seven miles northwest of Banbury. It gave its name to the first great battle of the Civil War, which was fought there on Sunday, October 23, 1642, between the Royalist forces under Charles and the Parliamentarians under the Earl of Essex. The King's forces had the advantage in numbers and in cavalry, as well as in position upon the hill; Essex, however, had the more formidable train of artillery. He began the fight by firing upon the Royalists, who immediately replied with their cannon. The Royalists descended the hill, and Prince Rupert, who led the right wing, charged with his cavalry the left wing of the Parliamentarians, broke it, and pursued it to Keinton, where his men, regardless of the main army, busied themselves in plunder. This was the fatal movement of the day. The right wing of the Parliamentarians had charged and recharged with the greatest success, until, after some stubborn fighting around the royal standard, the Royalists broke and retreated toward the hill. Disastrous to both armies, the result of the battle was indecisive. Over four thousand men were slain at the foot of Edgehill, and of these the greater number were Royalists.

EDGE'WORTH, Maria (1767-1849). An English novelist, the daughter of Richard Lovell Edgeworth, of Edgeworthstown, Longford, Ireland. She was born at Black Bourton, Oxfordshire. In 1782 her father returned to Ireland, accompanied by his family, to whose education he earnestly devoted himself. Maria's talents quickly developed. Her first important literary effort, written in conjunction with her father, was entitled *Practical Education* (1798). In 1802 appeared the delightful *Essay on Irish Bulls*, which was also in part the work of Mr. Edgeworth. But it was in the sphere of fiction that Miss Edgeworth won her greatest triumphs. In 1800 she published *Castle Rackrent*, the first of an extensive series of novels characterized in general by a quiet, agreeable humor, excellent sense, and lively delineation of character and manners. In 1801 appeared *Belinda;* in 1804, *Popular Tales;* in 1806, *Leonora;* and from 1809 to 1812 *Tales of Fashionable Life.* Among the most successful of her *Tales of Fashionable Life* were "Ennui" and "The Absentee." Miss Edgeworth's stories for children, among which are "Harry and Lucy," "Rosamond and Frank," are deserving of high praise. Her *Stories of Ireland* roused much interest, and Scott attributed *Waverley* to a desire to do for Scotland what she was doing for Ireland. Consult: New Longford edition of *Tales and Novels* (10 vols., London, 1893); Thackeray-Ritchie, *Book of Sibyls* (London, 1883); Lawless, *Maria Edgeworth* (New York, 1904).

EDGEWORTH, Richard Lovell (1744-1817). An English author. He was born at Bath; was educated at Trinity College, Dublin, and Corpus Christi, Oxford, and began the study of law, but gave it up and settled upon the family estates at Edgeworthstown, County Longford, Ireland. Edgeworth's friendship for Dr. Erasmus Darwin inspired in him a love for science, and much of his writing was upon scientific subjects. To his closest friend, Thomas Day, he is said to have suggested the writing of *Sandford and Merton.* He was a member of the last Irish Parliament, and, disregarding personal considerations, voted against the proposition of a union with England. Among his separate works are: *Letter to Lord Charlemont on the Tellograph and on the Defense of Ireland* (1797); *Practical Education* (1798); *Poetry Explained for Young People* (1802); *Professional Education* (1808); *Readings in Poetry* (1816); and *Essay on Construction of Roads and Railways* (1817). Consult *Memoirs* by himself and his daughter, Maria (London, 1820, 1844).

EDGEWORTH DE FIR'MONT (properly Edgeworth), Henry Essex (1745-1807). An Irish clergyman, confessor to Louis XVI. of France. He was born at Edgeworthstown (County Longford), was educated by the Jesuits at Toulouse, France, was trained for the Roman Catholic priesthood in Paris, and upon his ordination assumed the additional name of De Firmont. Having worked among the Irish and English in Paris, he was in 1791 appointed confessor to Madame Elizabeth, who recommended him to the King. After the condemnation of the King by the Convention on January 20, 1793, he was summoned to the Temple, through Garat, Minister of Justice. Between five and six o'clock on the morning of the execution (January 21) he celebrated the mass and later he rode with the King to the scaffold. He escaped to England, which he reached in 1796, and where he was offered by Pitt a pension which he then declined, but in 1806 accepted. He followed Louis XVIII. to Blankenberg and later to Mittau, where he died of a fever contracted while attending French prisoners. His epitaph was written by Louis XVIII.

EDGREN, ĕd'gren, Anne Charlotte Leffler (1849-92). A Swedish realistic novelist and dramatist, born in Stockholm. She was twice married, first to Municipal Secretary G. Edgren (1872-89), then (1890-92) to the Italian Duke of Cajanello. Her short stories, collected under the titles *By Chanoe* (1869), *From Life* (1882-83), *A Summer Story* (1886), *Woman and Love* (1890), and her dramas, *The Actress* (1873), *The Curate* (1876), *The Fairy* (1880), *Ideal Women* (1883), *The Struggle for Happiness* (1887), and, most popular of all, *A Rescuing Angel*, are the most noteworthy and characteristic of her many works. There is a *Life of Edgren* by Ellen Key (1893).

EDHEM PASHA, ĕd'hĕm pȧ-shä' (c.1813-93). A Turkish soldier and statesman, born of Greek parents on the island of Chios.. In 1831 he was taken to Paris, where he was educated in engineering, and made a special study of mining. Returning to Turkey in 1839, he was made a captain in the army and was assigned to duty in the topographical corps. He became an aide on the staff of the Sultan Abdul-Medjid in 1849, and rose rapidly to the position of general of a division and chief of the Sultan's military household. In 1854 he began his diplomatic career in a special mission to Servia. In 1856, incurring the displeasure of the Sultan, he was removed from his official position, but shortly afterwards was restored to power and appointed Minister of Foreign Affairs. Under Abdul Aziz he held various positions of importance. In 1876 he was ambassador at Berlin, and one of the representatives of the Porte at the international conference in Constantinople. Early in 1877 he was made Grand Vizier. From 1879 to 1883 he was ambassador at Vienna.

EDHEM PASHA (1851—). A Turkish soldier. By 1877 he had attained a colonel's commission, and during the siege of Plevna, in the war with Russia, was acting brigade commander. His bravery attracted the favorable attention of the Porte, and his subsequent rise was rapid. He was appointed Governor-General of the Vilayet of Kossovo, adjutant-general, and field-marshal, and in 1897 received the chief command of the Ottoman Army in the Græco-Turkish War. He mobilized 55,000 troops in three weeks, defeated the Greeks at the Maluna Pass, marched into Thessaly, and entered Larissa. His direction of the army, both in the field and in its hospital and sanitary arrangements, was very skillful. See GREECE.

EDIBLE BIRDS' NESTS. See SALANGANE.

EDIBLE FLIES. See EPHYDRA.

EDIBLE FUNGI. See FUNGI, EDIBLE AND POISONOUS; MUSHROOMS.

EDICT (Lat. *edictum,* from *edicere,* to proclaim, from *e,* out + *dicere,* to say). A rule of law promulgated by a superior magistrate. The power of making edicts (*ius edicendi*) belonged generally to the higher magistrates at Rome; but it was by the curule ædiles, and more extensively still by two prætors—the *prætor urbanus* and the *prætor peregrinus*—that it was prominently exercised. As this power was coextensive with the possession of what were called the honors (*honores*), it was frequently spoken of as the *ius honorarium;* and from its being exercised chiefly by the prætors, it was also known as the *ius prætorium.* The edicts of the prætors are mentioned by Gaius among the sources of the Roman law; but, strictly speaking, they are to be considered as rules promulgated by the magistrates on entering upon their office, rather than as expressions of the will of the Roman people, either direct or indirect. The edict of one prætor was not binding on his successor, but very often edicts promulgated by one prætor were adopted and confirmed by his successors in office, and thus came gradually to acquire the character of definite legal rules. Edicts which thus became a part of the permanent law of the Republic were frequently known by the names of their first promulgators, though they were often named with reference to the formula and the *actio* which they established.

The power of promulgating edicts is supposed to have been derived from the kings to the consuls, and through them to the prætors, and thus to have formed part of what we should call the royal prerogative. Even in Cicero's time the study of the edict had become a regular branch of the study of the law. In B.C. 67 the Lex Cornelia provided against the abuse of passing edicts for the decision of particular cases, by requiring the prætors to decide in conformity with the edicts which they promulgated upon assuming office, which were known as perpetual edicts (*edicta perpetua*).

The object of the edict, according to the Roman jurists, was to aid, supplement, and correct the civil law, and to render it more conducive to the public service, and they speak of it as "the living voice of the civil law." It was, in short, an indirect form of legislation, which public opinion sanctioned for the public convenience, and there can be no doubt that it contributed what was ultimately the most valuable part of the Roman law.

The edicts of the emperors, like those of the prætors, were also general rules, promulgated directly; but these had the superior validity which attached to the supreme magistracy, and soon took on the character of permanent law. They formed an important element in the *constitutiones,* in which the Imperial contributions to the law of the Empire were summed up. There were many commentators on the edicts under the emperors, among whom Labeo is mentioned and cited by Ulpian (*Dig.* 4, tit. 3, sec. 9). Julian is supposed to have collected and arranged the edicts, and given to them a systematic form. Gaius, Ulpian, and Paulus composed treatises on the edicts of the curule ædiles; and it is chiefly from the writings of these and the other jurists excerpted in the *Digest* that we know anything of the character of the edict, the portions of it which have been preserved being mere fragments. They have been collected by Wieling in his *Fragmenta Edicti Perpetui* (Frankfort, 1733). See CIVIL LAW; CONSTITUTION; DIGEST; PANDECTS.

EDICT OF NANTES, nänt. See NANTES, EDICT OF.

EDI′NA. A city and the county-seat of Knox County, Mo., 47 miles west by north of Quincy, Ill., on the Quincy, Omaha and Kansas City Railroad (Map: Missouri, D 1). It has flouring and saw mills, carriage and wagon works, a nursery, creamery, cold-storage plant, etc. There is considerable trade in live stock and agricultural produce. Population, in 1890, 1456; in 1900, 1605.

EDINBORO, ĕd′′n-bŭr-ŭ. A borough in Erie County, Pa., 17 miles (direct) south by southeast of Erie (Map: Pennsylvania, A 2). The Edinboro State Normal School is located here. Population, in 1890, 1107; in 1900, 691.

EDINBURGH, ĕd′′n-bŭr-ŭ. A royal and Parliamentary burgh, the capital of Scotland and county town of Midlothian, situated on a series of eminences about two miles south of the Firth of Forth and 47 miles east of Glasgow, in latitude 55° 57′ N. and longitude 3° 12′ W. (Map: Scotland, E 4). It now includes the town of Portobello on the Firth of Forth, as well as numerous other outlying districts which were annexed in 1896. The mean altitude is about 200 feet above the sea-level. Edinburgh is divided into the Old and New Towns by a deep ravine, the former bed of the Nor' Loch, which has been turned into the charming recreation grounds of East and West Princes Street Gardens. The gardens are crossed by the North Bridge, the Waverley Bridge, and the Mound, an artificial embankment, on which are built the Royal Institution and the National Gallery. The former contains an excellent collection of antiquities illustrating the progress of civilization and culture in Scotland, and a sculpture gallery. It is the meeting-place of the Royal Society and the Society of Antiquaries of Scotland; the National Gallery contains a very complete collection of the Scotch school of painting as well as numerous examples of the old masters. The annual exhibitions of the Royal Scottish Academy are held here. The Old Town, extending from the Castle on the west to the Palace of Holyrood on the east, contains the nucleus of the ancient burgh of Edinburgh, which grew up about the Castle, and the neighboring burgh of Canongate, which had its origin in the foundation of the Abbey of Holyrood, and which retained its separate municipality until the extensions of 1856, when it became an integral part of Edinburgh. Two main streets running almost parallel inter-sect the Old Town—High Street, which is known throughout its length by five different names, viz., Castle Hill, Lawnmarket, High Street, Netherbow, and Canongate; and Cowgate.

The Castle, which stands on the site of a structure built early in the seventh century by Edwin, King of Northumbria, occupies a rocky eminence 300 feet above the valley, and is accessible only on its eastern side. The present edifice dates from the fourteenth century. It has frequently served both as a place of residence and a prison for the Scottish kings. It was here that Mary Queen of Scots gave birth to her son James. In the so-called crown-room are kept the crown regalia, known as the *Honours of Scotland.* Holyrood Palace (q.v.) had its origin in an abbey founded by David I. in the twelfth century. It subsequently became the favorite residence of the Scotch monarchs, and was the scene of some of the tragic events in the life of Mary, Queen of Scots. Among the other notable features of the Old Town are the parish church of Saint Giles, the present edifice dating from the fourteenth century, with a handsome lantern spire, the burial-place of the Marquis of Montrose and the scene of the signing of the Solemn League and Covenant; the old Tron Church, the house occupied for a number of years by the great reformer, John Knox; Parliament House, formerly the meeting-place of the Scottish Parliament, but utilized since the Union as the seat of the Supreme Courts and containing the Advocates' Library, with over 506,000 volumes, the largest in Scotland and one of the five in the United Kingdom entitled to a copy of every book published in the kingdom. It also contains the Signet Library (100,000 volumes). The churchyard of Canongate Church is the burial-place of Dugald Stewart, Robert Fergusson, and Adam Smith, and Greyfriars' Churchyard contains the tombs of George Buchanan, Allan Ramsay, and Robertson, the historian.

The chief thoroughfare of the New Town is Princes Street, which skirts the ravine separating the two towns, and commands for its entire length an excellent view of the picturesque Old Town. In the eastern gardens facing Princes Street stands the Scott Monument, and at the easterly end of the street stand the Post-Office and Register House, the latter being the repository for all title deeds and public records. Above these buildings rises the Calton Hill to a height of about 355 feet above the sea-level, crowned by the Royal Observatory, Nelson Monument, and National Monument. It commands a magnificent panorama, only excelled by that obtained from Arthur's Seat, which rises to a height of over 800 feet behind Holyrood. At the foot of Calton is the old Calton burial-ground, which contains the grave of David Hume, the philosopher and historian.

Edinburgh is governed by a city council, which elects from its own members a lord provost, a city treasurer, and seven bailies, who constitute the civil magistracy. The Dean of Guild is elected to the council by the Guild Brethren. The city sends four representatives to Parliament. In the matter of municipal undertakings Edinburgh has been most active. Its water and gas supplies are managed by a joint commission with Leith. Since 1895 it has successfully operated an electric-light plant at a substantial annual profit. It also owns its street-railway lines, which, however, are operated by a private company at a rental of about 7 per cent. of the capital outlay. The traction-power is mostly cable. Baths, a public laundry, cemeteries, markets, and slaughter-houses are maintained by the corporation, and a considerable sum is expended annually in aid of technical education and for the maintenance of public libraries. Following the lead of its sister city Glasgow, Edinburgh has undertaken numerous schemes for the better housing of its working classes, and has erected several blocks of dwelling-houses, which are let in flats at an exceedingly low rental. The city's system of sewerage has been much improved, and now has four separate outlets into the sea. Its garbage is disposed of in destructors or sold for fertilizing purposes. Edinburgh has long borne an enviable reputation as an educational centre. At the head of its institutions of learning stands the university (q.v.). Other prominent educational institutions are the Heriot-Watt College; Heriot's Hospital, founded by a bequest of George Heriot, the jeweler of James VI.; Donaldson's Hospital, Gillespie's Hospital, the Merchant Company's Schools, the high school and Fettes College, the last-named being modeled on the plan of Rugby and Eton. The Royal Infirmary, consisting of a series of detached buildings in the Scottish baronial style, cost in the neighborhood of $2,000,000, and is considered one of the most excellently equipped institutions of its kind in Europe. There are numerous parks and recreation grounds, including Queen's Park of nearly 700 acres, the Meadows, the Links, and Braid Hills.

Edinburgh is not an important manufacturing town; it, however, derives considerable commercial importance from its various banks and insurance offices. The principal industries are brewing (two-thirds of all the ale or beer brewed in Scotland being made in or near Edinburgh), printing and publishing with the kindred arts, distilling, iron-founding, tanning, and coach-building, manufacture of articles in india-rubber, of house furniture, and of jewelry, and the rearing of young trees in nurseries in and around the town. Imports and exports amounted in 1905 to $85,442,000 and $37,110,000 respectively.

Edinburgh is the place of residence of considerable numbers of the Scottish landed gentry, and its society is regarded as unusually polished from the predominance of the professional and literary elements in its composition. This arises from its status as a university town, and from the presence of the Supreme Law Courts of Scotland. The picturesque and commanding situation of the city, combined with its literary fame, has acquired for it the name of the "Modern Athens." The climate is healthful, the mean temperature averaging 48° Fahr., with an average rainfall of about 27 inches. Population, in 1901, 316,479; in 1905, 336,577.

Edinburgh is supposed to have sprung up round the castle built in the seventh century by Edwin, King of Northumbria (Eadwin's burgh). It quickly grew to be a place of importance, and in the eleventh century was a royal residence. Around the Abbey of Holyrood (q.v.), which David I. founded in 1128, rose the town of Canongate, later annexed to old Edinburgh. From Robert the Bruce the burghers received a charter which granted them a great degree of self-government and the possession of the port of Leith. In the fifteenth century the Scottish kings sought refuge from their turbulent nobles in the Castle of Edinburgh, and the town became the capital of the kingdom, and was closely connected with the chief events of Scottish history for the next two hundred and fifty years, witnessing the fortunes of Mary Stuart (q.v.), the spread of the Reformation, and the battles of the Covenanters. The accession of James VI. to the English throne in 1603, and the union with England in 1707, deprived Edinburgh of much of its political prominence, but it acquired instead great fame as the literary centre of Scotland, the home of Walter Scott, Jeffrey, and John Wilson ('Christopher North'). The new town dates from 1763, after the Nor' Loch had been drained and bridged.

BIBLIOGRAPHY. Grant, *Old and New Edinburgh* (3 vols., London, 1882); Gillies, *Edinburgh, Past and Present* (Edinburgh, 1889); Chambers, *Traditions of Edinburgh* (Edinburgh, 1889); Stevenson, *Edinburgh, Picturesque Notes* (London, 1889); Oliphant, *Royal Edinburgh: Her Saints, Kings, Prophets, and Poets* (London, 1890); Gullard, *How Edinburgh is Governed* (Edinburgh, 1891); Wilson, *Memorials of Edinburgh in the Olden Time* (Edinburgh, 1891); Hutton, *Literary Landmarks of Edinburgh* (New York, 1898); Geddie, *Romantic Edinburgh* (London, 1900); Smeaton, *Edinburgh and Its Story* (New York, 1904); Fulleylove and Mason, *Edinburgh Painted and Described* (New York, 1905).

EDINBURGH, UNIVERSITY OF. A Scotch university which owes its origin to a bequest of Robert Reid, first Bishop of Orkney in 1588, and to the later encouragement of the municipality of Edinburgh. In 1563 the latter purchased ground on the site of 'Kirk o' Field,' and by grants of confiscated church property from Queen Mary, and a charter from James VI. (James I. of England) in 1582, the university was finally established. It was formally opened, and teaching begun, in 1583, though it was at first, strictly speaking, only a college of arts. In 1642 a chair of theology was established, and in 1685 one of medicine. After 1688, the institution, with other Scotch universities, was subjected to Parliamentary visitation. At the beginning of the eighteenth century the present arrangement of the faculty of arts came into existence, and this, with the reorganization of the institution, including the establishment of a law faculty, gave it the rank and title of the University of Edinburgh, which it has since held. Until 1858 the university had been almost entirely under the control of the municipality, but in that year, by the act of Parliament regulating Scottish universities, the administration was vested in a self-governing corporation of members, the *senatus academicus*, and the university court, together with a body of curators selected partly by the university and partly by the city, and in whose hands lay the patronage of the professional chairs. By the Universities of Scotland Act of 1899, the University Court was constituted as a body corporate, holding all property, and having all powers of administration. It consists of the rector, principal, Lord Provost of Edinburgh, one assessor nominated by the chancellor, one by the rector, one by the Lord Provost, magistrates, and town council of Edinburgh, four by the general council, representatives of the affiliated colleges. The university senate, consisting of the principal and professors, regulates teaching and discipline. The general council, consisting of the chancellor, members of the court, professors, and graduates, reviews the measures presented to it, makes recommendations, elects the chancellor, and, with the general council of the University of Saint Andrews, returns one member to Parliament. The chancellor confers degrees, sanctions changes in ordinances, and presides over the general council. The principal, elected by the curators for life, presides over the senate. The rector, an interesting mediæval survival found in Scotch universities, is elected by the students for three years, and presides over the court. The office is almost invariably filled by some man, not necessarily connected with the university, who is distinguished in politics or letters, as Gladstone, Carlyle, Lord Rosebery, and Goschen. There are faculties of arts, science, divinity, law, medicine, and music. A students' representative council has certain rights of petition in matters affecting teaching and discipline.

Candidates for a B.A. degree must attend full courses in at least seven subjects: four—Latin or Greek, English or a modern language, or history, logic and metaphysics, or moral philosophy, and mathematics or natural philosophy—being required, and three elective. Each course must consist of not fewer than one hundred hours, or meetings of the class. For a degree with honors, special classes and courses are provided. Special regulations are in force for the higher degrees of M.A., D.Sc., D.Phil., and D.Litt., to all which women are admitted. The university grants also degrees in medicine, law, divinity, and music, of which those in medicine are open to women. There are a large number of bursaries (76), and many prizes, apportioned among the different faculties. The increase in the number of students and teaching force of the university led to a movement in 1869 for the enlargement of the buildings, and in 1878, sufficient sums having been raised, the 'new buildings' were begun. These, completed in 1888, together with M'Ewan Hall, finished in 1897, and the School of Music (1858), constitute the modern additions to the original buildings. The university library, which contains 225,000 volumes and 7000 MSS., was founded by Clement Little in 1580. There are, besides, a number of special libraries in theology, classics, philosophy, history, physiology, and music. The museums include that of natural history (1812), and a considerable number in various departments of learning, partly or wholly belonging to the professors in the several subjects. The Royal Botanic Garden has also some connection with the university. The budget for 1900-1 was over £86,000, the number of students (1905) 3140. Long is the list of worthies: Blair, Akenside, Thomson, Hume, Goldsmith, the geologist Hutton, Brougham, Scott, Palmerston, Carlyle, Earl Russell, Balfour Stewart, Darwin, Robertson of Brighton, Robert Louis Stevenson, Crockett, Barrie, and Sir Conan Doyle. Its professors have been equally distinguished: Dugald Stewart, Sir William Hamilton, Playfair, Chalmers, John Wilson, Aytoun, Masson, and his successor, Saintsbury.

Consult: Grant, *Story of the University of Edinburgh* (Edinburgh, 1884, best account); Dalzel, *History of the University of Edinburgh* (Edinburgh, 1862); *Calendar of the University of Edinburgh* for current year.

EDINBURGH, ALFRED ERNEST ALBERT, Duke of (1844-1900). The fourth child and second son of Queen Victoria. He was also Earl of Ulster, and of Kent, and in 1893 succeeded his uncle as Duke of Saxe-Coburg-Gotha. He was educated by special tutors, went into the royal navy at the age of fourteen, and served chiefly on foreign stations. The Crown of Greece was offered to him in 1862, but he declined it. He married at Saint Petersburg on January 21, 1874, Marie Alexandrovna, Grand Duchess of Russia. In 1886 he received the appointment of admiral of the Mediterranean squadron.

EDINBURGH REVIEW. The first of the great critical periodicals which form a distinguishing feature of the literature of the nineteenth century. It was started in October, 1802, by a group of young men living in Edinburgh, the principal of whom were Francis Jeffrey (q.v.), Sydney Smith (q.v.), Francis Horner, and Henry Brougham (q.v.). So much was secrecy felt or believed to be necessary to the success of the undertaking that, according to the account which Jeffrey gave to Robert Chambers in 1846, 'the dark divans' of the reviewers were held for some time "in a dingy room off Willison's printing-office in Craig's Close," to which each repaired alone, and "by back approaches or different lanes." Of the first number, 750 copies were printed; the demand exceeded this limited supply; 750 more were thrown off, and successive editions followed. In 1808 the circulation rose to about 9000, and in 1813 to about 13,000. The original publisher was the well-known Constable. Sydney Smith edited the first three numbers, and was then succeeded by Jeffrey. The influence of the *Edinburgh Review* in developing and strengthening the political convictions of the Whig Party cannot be overestimated; but its power was even more visible, certainly more immediately palpable, in literature. The keenness of criticism, the sharpness of wit, and the brilliancy of style exhibited by the writers, created a sensation in the world of letters; and although in the case of Wordsworth, Southey, and other writers of the romantic school, unfairness of a flagrant kind was undoubtedly exhibited and persevered in, yet impartial justice was, on the whole, administered. After the period of Jeffrey, the most brilliant contributor to the *Edinburgh Review* was Macaulay. It is now published in London. Consult Napier, *Life and Correspondence* (London, 1862).

EDINBURGHSHIRE, or MIDLOTHIAN. The metropolitan county of Scotland in the southeastern division, lying on the south side of the Firth of Forth (Map: Scotland, E 4). Area, 366 square miles. From the southern border, the Pentland Hills (mean height 1000 feet, and highest point 1898 feet) and the Moorfoot Hills (mean height 800 feet, and highest point 2136 feet) run northeast through the country. In the north are fertile plains, varied by gentle slopes. The chief rivers, not above 20 miles long, are the Esk, Water of Leith, Almond, and Gala Water. The coast has coal-mining and other industries, but the county is chiefly agricultural, with large farms. Near the metropolis are extensive nurseries, vegetable and fruit gardens, and dairy pastures. The chief towns are Edinburgh, the capital, and Leith, its seaport. Population, in 1801, 122,600; in 1851, 250,400; in 1901, 488,796.

ED'ISON, THOMAS ALVA (1847—). A celebrated American electrician and inventor. He was born at Milan, Ohio, February 11, 1847, and when he was seven years of age his family moved to Port Huron, Mich., where the remainder of his boyhood was passed. While a mere lad he started in business as a newsboy on the Grand Trunk Railway. His spare hours were spent in reading and in boyish experiments, largely with printing-presses and electrical and mechanical apparatus. In 1862 he published a weekly, known as the *Grand Trunk Herald,* and did the printing in a freight-car that also served as a laboratory where he could carry on further experiments. For saving the child of a station master from the wheels of an approaching car, he was received as a pupil at the telegraph office at Mount Clemens, and there learned to become an operator. While a brilliant and rapid operator, he was besides fun-loving and erratic, as well as too fond of experimenting and disregarding the rules of the office to remain long in any one situation. It was while thus engaged that he made his first important invention, a repeating instrument, which enabled a message to be transmitted automatically on a second line without the presence of an operator. From the West Edison went to Boston, where, owing to his skill as a rapid operator, he soon secured a position, and was also able to work on various mechanical inventions which suggested themselves to his ingenious mind. Among these was a vote-recorder, which, while accomplishing its object, did not possess merits of a sufficiently practical character to warrant its adoption. Recalling this failure, Mr. Edison said that afterwards he investigated minutely the necessity of any particular invention before he attempted to reduce it to practice. In this has been his great success as an inventor. Few, if any, great scientific discoveries are to be credited to Edison, but he has triumphed over almost insurmountable difficulties, and by his skill and ingenuity brought to practical use and the advancement of civilization what had often been suggested by some scientific investigator unable to bring it to a successful outcome or practical realization. While in Boston, Edison devised and partly completed a stock-quotation printer, and later became connected with the Gold and Stock Telegraph Company of New York, whose apparatus and service he greatly improved. Valuable inventions of stock-printing and other telegraph appliances were sold for $40,000, which enabled Edison to establish a laboratory on his own account and to work out some of his more important ideas. About this time came his automatic telegraph system, by means of which increased speed and range of action were obtained. Edison's crowning achievement in telegraphy (see TELEGRAPH) was his invention of the quadruplex system, which followed a duplex system he had previously devised, and which was a great commercial success and made possible a far greater use of existing telegraph lines. Of the greatest value in the development of the telephone (q.v.), then recently invented by Bell, were the microphone and the carbon transmitter, and the latter of these devices was employed extensively in the earlier instruments. In 1878 Edison brought out his phonograph with the tin-foil cylinder, and about this time the megaphone. The most-used of all Edison's inventions, and the one that required the most careful research and experimenting to secure its perfection, was that of the incandescent light, which, brought out in 1879, was publicly exhibited in 1880. This new light soon achieved a remarkable success, and the inventor was fully occupied in improving the lamps themselves and the dynamos for generating the current. Mr. Edison also worked on the question of electric traction, but his achievements here, while attended with some success, were not so remarkable as in other fields. In 1886 his laboratory at Orange was built and furnished a commodious workshop for his later experiments. Here the kineto-phonograph was developed, and the instrument in its well-known form of the kinetoscope was made a commercial success. Among his commercial ventures have been the magnetic treatment of iron ore and a plant for the manufacture of Portland cement. Edison has received numerous honors at international expositions and from foreign governments, among which are his appointment as a chevalier of the Legion of Honor from France in 1878, and as a commander in 1889. In 1892 he received the Albert Medal of the Society of Arts of Great Britain. Edison as an inventor stands unique among those men of the nineteenth century who have applied scientific discoveries to the ordinary uses of man. His boldness in overcoming experimental difficulties, and his successful achievement of what might be termed all but impossible, secured for him the name of Wizard.' In considering his life and work, however, the distinction must be made between the pure scientist with mathematical and philosophical knowledge, and the ingenious inventor who can apply a scientific truth to a practical end. Of this latter class Edison stands at the head. For a life of Edison, consult Dickson, *Life and Inventions of Thomas A. Edison* (New York, 1894), a popular biography which leaves considerable to be desired.

ED′ISTO ISLAND. One of the 'sea islands' so famous for long-staple cotton, on the South Carolina coast, about 25 miles southwest of Charleston (Map: South Carolina, D 4). The soil is fertile, and the vegetable trade of the island with the North is considerable. Population, about 400.

EDISTO RIVER. A river in the southern part of South Carolina, formed near Branchville by the union of its north and south forks (Map: South Carolina, D 3). It flows southeast, then south, and divides into the North and South Edisto about 15 miles from the coast. These arms embrace Edisto Island, and reach the Atlantic southwest of Charleston Harbor and just north of Saint Helena Sound. The river is about 150 miles long, and is navigable two-thirds of this distance.

EDITIO PRINCEPS, ĕ-dĭsh′ĭ-ō prĭn′sĕps. The Latin term for the first edition of a book. The term is especially used with reference to the first printed edition of a Greek or Latin author. See INCUNABULA.

EDLUND, ĕd′lo͞ond, ERIK (1819-88). A Swedish physicist. He was born in the District of Nerike, and was educated at Upsala. In 1850 he became professor of physics at the Royal Academy of Sciences in Stockholm, and in 1858 was instrumental in securing the introduction of meteorological stations in Sweden. He conducted these observatories until 1873, when a central meteorological station was erected. His scientific researches were confined chiefly to the theory of electricity. His publications include *Théorie des phénomènes électriques* (1874), in which he discusses unipolar induction, tracing the origin of electricity to the rotation of the earth and of the higher strata of the atmosphere. The meteorological observations made by Edlund from 1858 to 1873 were published in fourteen volumes by the Academy of Sciences of Stockholm.

EDMONTON, ĕd′mon-ton. A city in the province of Alberta, Canada, 192 miles north by northeast of Calgary, on the Canadian Pacific and the Canadian Northern railroads and on the north branch of the Saskatchewan River (Map: Northwest Territories, G 4). Coal-mining and lumbering are the principal industries. Alluvial gold is found in the vicinity. It is in a fertile agricultural district, and is an important fur-trading station, being an old Hudson's Bay Company post. Edmonton has a meteorological station in daily communication with the United States Weather Bureau, and is, statistically, the storm centre of the Northern States of America. Population, 1901, 2626; 1906 (local est.), 10,000.

EDMONTON. A town of Middlesex, England, seven miles north-northeast of London. It is the suburban residence of many London merchants. Charles Lamb is buried in the churchyard, and the Bell Inn figures prominently in Cowper's humorous poem of "John Gilpin." Population, in 1891, 25,381; in 1901, 46,899. Consult Robinson, *The History and Antiquities of Edmonton* (London, 1819).

ED′MUND, or **EADMUND** (AS., defender of property) (c.922-46). King of the English from 940 to 946. He was the son of Edward the Elder, and the grandson of Alfred the Great, and succeeded his brother, Æthelstan, on the throne. Three years before his accession he had shown remarkable bravery in the battle with the Danes at Brunanburh (q.v.). Soon after he became King, a revolt broke out in the North, and Olaf, or Aulaf, the leader of the Danes from Ireland, was made King. For a time the revolt was successful, and the Danelaga (q.v.) was revived under a second Olaf and Ragnar; but about 944 Edmund subdued both kings. In 945 he conquered Cumbria, and gave it to Malcolm of Scotland to be held in military service. Edmund was slain by an outlaw, May 26, 946, while at a banquet. Consult Green, *Conquest of England* (London and New York, 1883).

EDMUND, or **EADMUND** (c.981-1016). A king of the English, known as IRONSIDE. He was the son of Ethelred II., and half-brother of Edward the Confessor. He is celebrated chiefly as the great opponent to Canute and the Danish party during the latter part of his father's reign. On the death of Ethelred, in 1016, the Danes proclaimed Canute King of England, but the citizens of London declared for Edmund, who drew together his forces and engaged Canute at Pen, in Somersetshire, and at Sherston, in Wiltshire.

In both battles he was victorious; but a severe defeat which he sustained at Assandun in Essex compelled him to make terms with the enemy. An arrangement was entered into by which England was divided between the two kings, Canute obtaining possession of the north, and the south falling to the share of Edmund. It seems probable that it was also agreed that on the death of either the survivor was to succeed him. Edmund died a few weeks after this agreement had been concluded, and Canute became King of England, November 30, 1016. According to the Anglo-Saxon Chronicle, Edmund received the surname of Ironside for his extraordinary courage and physical strength. Consult: Freeman, *The Norman Conquest*, vol. i. (2d ed., Oxford, 1870); Green, *The Conquest of England* (London and New York, 1883).

EDMUND, Saint (c.1170-1240). An English archbishop and ascetic. His name was Edmund Rich. He was born at Abingdon between 1170 and 1175. He early adopted the ascetic life and followed its rules with a rigor amounting to heroism. He studied at Oxford and Paris and became a priest. In 1227 he was one of the preachers of the sixth crusade. In 1234 he became Archbishop of Canterbury. He was involved in many disputes and quarrels, both political and ecclesiastical. In 1240, broken down by such contentions and his severe mode of life, he left his post and went to Pontigny in France, soon after to Soisy, where he died November 16, 1240. For his life, consult Masse, Eng. trans. (London, 1874).

EDMUND. The bastard son of the Earl of Gloster, in Shakespeare's *King Lear*. He supplants Edgar in Gloster's affections, works the disgrace and ruin first of his brother and then of his father, wins the love of both the wolfish daughters of the unhappy King, and is the main cause of the catastrophe of the play.

ED'MUNDS, George Franklin (1828—). An American lawyer and legislator. He was born at Richmond, Vt.; was educated in a common school and by a private tutor; studied law, and in 1849 was admitted to the bar. He settled in Burlington in 1851, and from 1854 to 1859 was a member of the State Legislature, being for three years Speaker of the Lower House. In 1861-62 he served in the State Senate, and was president *pro tem.* When the Civil War broke out he was a member of the State Convention which met to form a coalition between the Republicans and the War Democrats, and he drew up the resolutions adopted by that convention as the basis of union. At the death of Solomon Foot in 1866, Edmunds was appointed to fill the vacancy from Vermont in the United States Senate, and held office until his resignation in 1891. In the Senate he served on the committees on Commerce, Public Lands, Pensions, Retrenchments, and the Judiciary. He was a member of the Electoral Commission (q.v.) in 1877, was for several years at the head of the Senate Judiciary Committee, and was president *pro tem.* of the Senate during Arthur's administration. He was the author of the Anti-Polygamy Act of 1882, known as the 'Edmunds Act,' and of a somewhat similar act passed in 1887. After retiring from the Senate he practiced law and attained great eminence as a constitutional lawyer.

E'DOM (Heb. *edōm*, red, Gk. *'Ιδουμαία, Idoumaia*). According to the Old Testament, which places the Esauites in possession of Edom, the latter becomes one of the names of Esau, fancifully explained because of the 'red' pottage given him by his brother Jacob (Gen. xxv. 29-34). (See Esau.) The ruddy hue of the sandstone cliffs may have had something to do with the naming of the region. The name, under the form *Udumu*, occurs in the Tell-el-Amarna Tablets (c.1400 B.C.). It is designated as a city, and since in later Assyrian inscriptions it is sometimes designated in the same way, though also as a country, it has been concluded that the district received its name from its chief city. Another and apparently older name was Seir, which is the designation of the mountain range. Originally in the possession of the Hivites, it passed into the hands of the Esauite group. The latter, however, does not drive out the former, but intermarries with it (Deut. ii. 22, and Gen. xxxvi. 20-21).

Edom comprised a strip of country 100 miles long by 20 miles broad, lying between the south of Palestine and the Gulf of Akabah (an arm of the Red Sea). It is a wild, mountainous region with the desert on the east and west of it; but rugged though it looks, it contains rich glens and terraces, where flowers and shrubs and trees spring up luxuriantly. Its chief city in later periods was Bozrah (now Buseirah) in the extreme north; its seaports were Elath and Ezion-geber in the extreme south at the head of the Gulf of Akabah. The relations between the Hebrews and Edomites, despite the recognition of their close relationship, were for the most part hostile, and this hostility is carried back in historical traditions to the time when the Hebrews were refused permission to pass through Edom on their way to Canaan (Num. xx. 14-21), and were obliged to pass eastward of the land and make their way to Moab. During the reigns of David and Solomon the Edomites were brought under subjection to the Israelites, and despite many uprisings (I. Kings xi. 14-22; II. Kings viii. 20-22; xiv. 22), they remained in the power of Israel until the time of Rezin of Damascus (II. Kings xvi. 6); nevertheless the Edomites repeatedly ravaged the southern border of Palestine and rejoiced when Judah was destroyed, which circumstance is the reason that they are so terribly denounced by some of the prophets (Lam. iv. 21-22; Ezek. xxxv. 3-15; Obad. 10-16).

In the Assyrian inscriptions Edom is frequently mentioned. In B.C. 732 Edomites appear among those who are forced to pay homage to Tiglathpileser III. at Damascus, while twenty years later we find Edom again joining a league with Moab, Judah, Philistia, and Egypt, against the Assyrian King Sargon. The allies were obliged to submit and pay tribute. Once more, in B.C. 701, when Sennacherib threatened Palestine and Syria, Edom joined issue with Hezekiah in an attempt to withstand the attack. In view of this, it is rather strange to find the inference in the Old Testament narratives that at the time of the attack of Nebuchadnezzar upon Jerusalem the Edomites assisted the Babylonians. In the post-exilic period the Edomites are enabled to extend their domain and occupy a portion of southern Judah, with Hebron as a capital, and during the Maccabean war the Jews had to contend not only with the Greeks, but with the Edomites as well, who endeavored to avail themselves of the situation by making attacks upon the Jews. Judas Maccabæus, however, drove them from southern Judah (B.C. 164) and John Hyrcanus (B.C. 109) is said to have conquered their country, though he held only the western part of it, and that not for a long time. The eastern part, with its capital at Selah (of which Petra is the Greek translation), remained in the hands of the Nabatæans, who had held it since B.C. 300. The Roman conquest swept away the last remnant of Edomitic independence. The country, now called after the Greek from *Idumæa*, was placed under control of a procurator and grouped with Judea, Samaria, and Galilee; and Antipater, an Idumæan, succeeded, by gaining the favor of the Romans, in obtaining this position. His son was the famous Herod the Great. (See ANTIPATER; HEROD.) After the destruction of Jerusalem, the country was merged in Arabia Petræa, and the name Idumæa disappears.

ED'RED, or **EADRED** (?-955). A king of the English. He was the son of Edward the Elder and succeeded his brother, Edmund I., in 946. The Danes in Northumbria revolted during his reign, but were finally subdued. He was succeeded by his nephew Edwy, or Eadwig, in 955.

EDREMID, ā'dre-mĕd'. A town of Asiatic Turkey, situated in the Vilayet of Brusa, about three miles from the Gulf of Adramyti (Map: Turkey in Asia, B 3). It lies in a very fertile region abounding in vineyards and olive groves. The town in itself is rather unpretentious, but derives considerable importance from the proximity of iron deposits in Mount Ida, and its trade in oil, raisins, and timber. The population is a little over 6000, of whom about one-fourth are Greeks. The ancient city of Adramyti, situated nearer to the coast, was a very important commercial port.

ED'RISI, ABU ABDALLAH MOHAMMED ESH-SHERIF, called also AL EDRISI, AL SIKIH, AL RODJARI (c.1100-?). An eminent Arabian geographer, born at Ceuta about 1100. By descent he was a member of the famous Edrisi family, which in turn traced its line to Mohammed himself. He studied at Cordova, where he devoted himself to the study of geography, astronomy, and medicine. Having completed his studies, he traveled through Asia Minor, Egypt, Morocco, Spain (some say also England and France), and Portugal. On the invitation of Roger II. of Sicily, he came there and began a geographical work which he finished in 1154. From his own notes and from outside information he constructed a globe of silver. This, in accordance with the Ptolemaic system, he divided into seven climates, intersecting each with eleven regions, represented by perpendicular lines. In explanation he wrote a book. In 1592 this work was published at Rome in Arabic, while a Latin translation of it, under the title *Geographia Nubiensis*, was made in Paris (1619) by Gabriel Sionita and Johannes Esronita. Dozy published a portion of it, *Description de L'Afrique et de l'Espagne*, in 1866. Another portion, *L'Italia*, has been published by Amari and Schiaparelli (1883). Jaubert published a complete translation in French (1836-40), but the translation is untrustworthy. The date of the death of Edrisi is uncertain.

ED'SALL, SAMUEL COOK (1860—). An American Protestant Episcopal bishop, born at Dixon, Ill., and educated at Racine College and Western Theological Seminary. He was ordained to the priesthood in 1889, and in the same year was appointed to the rectorate of Saint Peter's Church, Chicago. After an activity here of ten years, he became Missionary Bishop of North Dakota, serving until 1901, when he was elected Bishop of Minnesota.

ED'SON, CYRUS (1857-1903). An American physician, born at Albany, N. Y. He studied at Columbia and the College of Physicians and Surgeons, in 1882 was appointed assistant sanitary inspector of New York City, and rose to be health commissioner. In 1893 he was appointed health commissioner of the State of New York. He was three times elected president of the Board of Pharmacy of the City and County of New York. He was well known as a bacteriologist, invented several surgical instruments, and wrote a large number of articles on sanitary and medical topics.

EDUCATION (Lat. *educatio*, from *educare*, to rear, nourish, bring up, from *educere*, to lead out, from *e*, out + *ducere*, to lead). In a general sense, the development of the whole nature of man, physical, intellectual, and moral, through interaction with every phase of his environment; in a narrower and more usual meaning, the development of the powers or capacities of the mind through special processes of training. No one application of the term has now or ever had a common acceptance, for it may have a variety of special applications. Quintilian applied it to the general processes of training in the child's earliest years, in distinction from the formal school processes, called instruction. The Greek idea of education included both the early process of training, or formation of habits based upon authority, and the later process of instruction, or the rationalizing of the habits formed. This general conception is formulated by Plato as follows: "Good education is that which gives to the body and to the soul all the perfection of which they are capable." For many years the popular idea has been limited to the narrower one of instruction, but recently, under the influence of the conception of evolution, it has been realized that every stimulus that sets up a series of reactions in the human organization has some influence in shaping the final character. However, such a conception is too vague to be of any general value, and some such formulation as the following is now of common acceptation: Education includes all those processes consciously adopted by a given society for realizing in individuals the ideals which are approved by the race or by the particular group; while instruction includes all those definite means and methods adopted under the direction of a particular institution, usually the school, for accomplishing certain particular ends, wholly or for the most part of an intellectual character. The greater part of this article will be devoted to a sketch of the theory of education, with enough detail of the actual practice to illustrate the true nature of the theory. This presentation is supplemented in the articles relating to the prominent educators of the past, especially those about Abélard, Alcuin, Aristotle, Basedow, Comenius, Fellenberg, Fröbel (or Froebel), Herbart, Locke, Horace Mann, Montaigne, Pestalozzi, Plato, Quintilian, Rabelais, Ratichius, Rousseau, Herbert Spencer, Sturm. A further discussion of the principles of education, especially in relation to their application as an art, is given in the articles on PEDAGOGY and on PSYCHOLOGY. The subject of educational method, treated primarily in the article on PEDAGOGY, is treated in some of its aspects in the articles on BASEDOW; COMENIUS; FRÖBEL; HERBART; JACOTOT; LANCASTER, JOSEPH; NORMAL SCHOOLS; OBJECT TEACHING; and PESTALOZZI. The present condition of educational systems and practices, together with a sketch of their historical development since the Reformation, is given in the article NATIONAL EDUCATION, SYSTEMS OF. Special phases of the existing educational systems are discussed under the titles: AGRICULTURAL EDUCATION; CHAUTAUQUA; COLLEGE; COLLEGES, AMERICAN; COMMON SCHOOLS; CURRICULUM; EDUCATION, COMMERCIAL; EVENING SCHOOLS; GRAMMAR SCHOOLS; GYMNASIA AND REALGYMNASIA; INDUSTRIAL SCHOOLS; INFANT SCHOOLS; MONITORIAL SYSTEM; NORMAL SCHOOLS; PROFESSIONAL EDUCATION; REALSCHULEN; TECHNICAL EDUCATION; UNIVERSITIES; and UNIVERSITY EXTENSION. The more important present educational tendencies and problems are considered under the topics CO-EDUCATION; COLLEGIATE EDUCATION FOR WOMEN; COLLEGES, AMERICAN; EDUCATION, COMMERCIAL; CURRICULUM; ELECTIVE COURSES; GRAMMAR SCHOOLS; KINDERGARTEN; MANUAL TRAINING; OBJECT TEACHING; NORMAL SCHOOLS; PARISH SCHOOLS; PEDAGOGY; and SCHOOLS. Certain aspects of these topics are also treated in the articles relating to the special universities, colleges and public schools, and in the sections on education in the articles BELGIUM, FRANCE, GERMANY, GREAT BRITAIN, etc.

TYPES OF EDUCATION. The definitions given above indicate that education has two phases, more or less distinct. First, it is the physical and psychical development of the individual, solely with reference to these activities within themselves; and second, it is the process of adjusting the human being to his social environment—to the ideals and customary practices of his fellows. So far as the process is concerned, these two phases are not distinguishable, but are rather complementary; whereas, in reference to the conception and the realized purpose, they are clearly differentiated and often are in conflict. Its history presents many aspects that find a common explanation in the varying emphasis placed upon the individual and social phases, together with the relative importance which the activities for supplying food, clothing, and shelter assume at any given stage of culture. Among primitive people education was largely practical, and centred in the family group. It was essentially a training given the child, ordinarily by his parents, in the customary processes of supplying the needs of food, clothing, and shelter. (Consult Letourneau's *L'évolution de l'éducation dans les diverses races humaines*, Paris, 1898.) These activities necessitated a variety of ceremonial observances relating to every interest in life in order to secure proper adjustment to the spirit world, omnipresent to the savage and the barbarian. As a priesthood developed priests had instruction in the preservation and explanation of tradition and ceremonies, as distinct from the broader ceremonial education of all the people. Out of this esoteric training of the priesthood, and the attempt to construct cosmographies, grew in time philosophy, science, and literature, and the higher types of education. Such types are best illustrated by the Hindus, the Egyptians, and the Jews. There developed, too, along with these early types of priestly instruction, a caste system of education for the masses of the people, that gave, in addition to the religious ceremonial education mentioned, a training in the practical affairs of life. In such a system the training was given by parent to child in the particular activities to which he had been confined in the growing division of labor. The caste system of education was highly developed by the Egyptians and the Hindus, and, with the latter, at least, has persisted until recent times. While the caste organization of society was never reached by the Jews, they did develop a system of industrial education akin to that of caste societies. The Chinese were the first of existing nations to develop a general system of literary education. While it does not of course affect all the people, it is at least open to all, and does reach large sections of the population. It is essentially literary, dealing primarily with the sacred literature, organized as a preparation for the civil service, tested and controlled by a series of examinations. The successful competitors in these examinations become public officials, and the conduct of the Government is thus placed in the hands of those who are by the very process of selection most opposed to innovations and to progress. This system, first organized in the time of Confucius, has undergone no radical change for the past thousand years. The recent trouble with the Western nations incident to the Boxer uprisings has given opportunity for the influences gradually creeping in through contact with the Westerners to affect the examination system, and radical changes are now going on. The ancient Persians, the Greeks, and the Romans, developed a national type of education which at first was largely military. But its political aspect expanded with Greek and Roman political life until individualism found full expression in an education both liberal and practical. Since that time the process has been growing more scientific, synthetizing these several modes, influenced in a varying degree by the ideals of Christian religion.

HISTORICAL SKETCH OF THE THEORY OF EDUCATION. The Greeks were the first to work out a theory and practice of education, based upon scientific principles rather than upon religious beliefs and ecclesiastical ceremonies. The purpose of the early education, with both Athenian and Spartan, was preparation for the duties of citizenship, military, political, and religious. With the Athenians their activities provided for intellectual and æsthetic development, illustrated in the drama, religious ceremonial, the symposium, the choral performance, etc. From the middle of the seventh century B.C. there were at Athens elementary schools of a twofold character: one was the music school, which in time embraced instruction in reading and writing; the other was the school for gymnastics and dancing, which for earlier years was called the palæstra, and, for the period of adolescence, the gymnasium. The training in gymnastics was not a direct military training, but was aimed to produce a beautiful, symmetrical, agile, and sound body through various exercises, chiefly running, jumping, discus-throwing, javelin-casting, wrestling, and boxing. Nor were the music schools designed to produce performers; they were rather schools of expression. "Gymnastic for the body, music for the soul," was Plato's summary of the process of education, each in its way to produce harmony of development. In the fifth century B.C. intellectual education was much broadened by the Sophists, and much greater scope given to individualism. It became more largely a literary process, differentiating into the rhetorical or oratorical and the philosophical education. Of the former, Socrates is the chief exponent; Socrates, Plato, and Aristotle are the chief exponents of the latter. In the *Republic* of Plato, which may be termed the first scientific treatise on the subject, elementary education consists of training in gymnastic and music, including letters; secondary, of the study of arithmetic, geometry, music, and astronomy; and higher, of dialectics or philosophy. The elementary studies produced a harmony of body and soul that was the basis of all virtue; the secondary led to unity of thought; and the higher led to the contemplation of pure being, the union of truth and beauty. The purpose of this education was to obtain an insight into the essential nature of things. In this treatise, together with that contained in the *Laws*, there is found the fundamental distinction between the liberal and the practical education, between the different stages of education, and between the groups of study so long recognized under the terms *trivium* and *quadrivium*. It is indicative of the importance of education in Greek thought that, with Plato and Xenophon and Aristotle, it finds a place in the discussion of the science of government. Not only is education to be intrusted to the State, it is the State's most important function. However, in practice the philosophical influence on education but reinforced the tendency toward individualism; for the formation of the philosophical schools still further weakened the Greek Commonwealth, instead of counteracting the disintegrating influence of the Sophists, as was the aim of the theory.

The rhetorical education of the later Greek period is best represented by Isocrates. It is this type that is reproduced at Rome, and best presented in Cicero's dialogue *On Oratory*, and Quintilian's *Institutes of Oratory*. The early Roman education consisted of a training for the practical affairs of life, economic, military, and political, for which little or no literary instruction was necessary. The Laws of the Twelve Tables, with the biography and legends of historical characters, furnished all the subject-matter of this stage, aside from the training given in practical duties. Under the influence of the Greeks a literary education was substituted, and with the early Empire there was developed an elaborate system consisting of an elementary school, the *ludus*, which had existed from early times, the grammar or secondary school, the rhetorical schools, and, in certain centres, as Rome, Constantinople, Marseilles, etc., a higher institution resembling the modern university. With the loss of liberty under the Empire, oratory lost its chief inspiration, and education became largely a process of formal training, in which even literature became a study of form. Though many of the emperors—among them Vespasian, Hadrian, and Antoninus—were patrons of education, learning ceased to have any profound influence on the character of society. Toward this formal intellectual life, represented in Greece by the philosophical schools, and in Rome by the rhetorical schools, the early Christian fathers were rather favorably inclined, notably Clement of Alexandria, Origen, and Basil; but later the attitude of the Christian teachers became distinctly hostile. Especially is this true of the Latin fathers, as represented by Tertullian and Saint Augustine, the latter being responsible for the edict of the Council of Carthage, which forbade the study of pagan literature by the bishops. The ascetic spirit was another cause of the opposition to learning and culture, since both were essentially worldly, and hence evil. Yet to monasticism (q.v.) is chiefly due the preservation of learning during the centuries known as the Dark Ages. The rules of Saint Benedict provide for the copying of manuscripts, and the reading or the hearing of the Scriptures as a part of the daily routine of monastic life. Yet during some centuries many monasteries existed in which no reading or writing could be done. On the other hand, the monasteries sheltered some at all ages who had an abiding interest in literature and learning. During the earlier centuries of the Middle Ages this was especially so of those monasteries that transmitted the Grecian influence. Saint Basil, in opposition to the extreme asceticism of Egypt and the East, had introduced a more intellectual element into Grecian monasticism; this was carried by Cassianus to southern France, and from there by Saint Patrick to Ireland. Celtic monasticism dominated the British Isles during the seventh and eighth centuries, and thence the intellectual interest was carried to France and the Continent by Alcuin in the eighth century, and by John Scotus Erigena in the ninth. Scotus marks the beginning of Scholasticism (q.v.), though the scholastic movement can hardly be said to have been general before the twelfth century, and it culminated in the thirteenth. Scholasticism was the first of the great intellectual revivals, unless the movement under Alcuin and Charlemagne can be considered a preliminary revival of interest in learning, organized now with the form if not the content of ancient times. (See ARTS, LIBERAL.) Scholasticism was distinctly an intellectual movement, beginning with the discussion of the Platonic and Aristotelian problems of the nature of ideas, and ending with the systematization of all thought in the form of a theological philosophy. However, the intellectual interest was clothed in a theological form, and partook of a logical rather than a rhetorical character; in fact, its exponents sought rather to avoid literary form for severe and precise statement. Out of the scholastic movement came the early universities, at least the one at Paris and its offshoots. In them intellectual interests were provided with a home, and education obtained that institutional foundation which had been wanting since the decline of Roman culture and government. This conception of the formal character of the subject matter of education and the disciplinary character of its method prevailed both within and without the universities until the Renaissance of the fifteenth and sixteenth centuries. At this time the world awoke to the fact that there were other interests in life besides the religious, and that there was a vast literature much more varied and complete than that upon which interest had been centred for many generations. Intellectual interests were stimulated, and the conception and purpose of education was broadened by the activities of such men as Petrarch, such teachers as Vittorino da Feltre, and finally by the influence of the universities, though they had responded somewhat slowly to the new influences.

The Renaissance emphasis upon the linguistic character of education introduced new secular interests into the then prevalent system. In early years instruction had to be of a religious character, and hence centred in the religious literature, which demanded a knowledge of the Latin language. Higher instruction was, to a large extent, preparation for controversial life in connection with religious doctrines and literature, and hence had also to be linguistic in its elements. The Renaissance interest in the rudimentary sciences and in the æsthetic element in literature was almost wholly eliminated from organized educational efforts; while in addition to this, the religious conflicts introduced by the Reformation movement, so agitated and demoralized the social, domestic, and political conditions of the times, that organized education, subjected like all other institutions to the distressful storms of the period, suffered greatly in the general upheaval. Nevertheless, during this agitated sixteenth century, there were educational influences at work, which crystallized into definite school organization and procedures, best typified by the work of Johannes Sturm (q.v.), and later by that of the Jesuits. Sturm, who was the head of the Strassburg Gymnasium from 1537 to 1582, organized a ten years' course of study, consisting of Greek and Latin grammar, rhetoric, and literature. Not till late in his forty-five years' experience did he introduce any study of mathematics into the last years of his curriculum. Sturm's ideas concerning organization and subject matter were most influential in shaping the developing school system of the German States. His course of study, slightly amplified, was adopted in the higher schools soon to become common under the term *gymnasia* (q.v.). His methods, embodied in text-books, were perpetuated and popularized in a similar manner, not only in German States, but elsewhere. Through Roger Ascham, the tutor of Queen Elizabeth and the friend of Sturm, similar educational ideas and practices were adopted as a characteristic feature of the public or grammar schools then being founded to some extent in England. In the latter part of the sixteenth century the Jesuit Order formulated its *Ratio Studiorum* (q.v.), embodying many ideas similar to those of Sturm. Their numerous schools were the most efficient and popular up to the middle of the eighteenth century, by the end of which there were 612 colleges, 157 normal schools, and 24 universities. Sturm and the Jesuits only organized the humanistic educational ideas of the Renaissance; and the resulting education was in its content a wholly literary one of the extremely classical type, while its purpose and discipline were largely determined by religious influences. Sturm was a Ciceronian, and it was wholly with the purpose of producing the ability to use the Ciceronian Latin and of securing the discipline entailed by this process that the dominant educators of the sixteenth and seventeenth centuries labored. During this period there were not wanting, however, those who protested against this formal education, and insisted that the purpose of the study of the classical literature was the possession of the knowledge contained therein, and not yet to be found in any of the vernacular literatures. Erasmus, though a humanist, took this position; but the two Frenchmen Rabelais (q.v.) and Montaigne (q.v.) were the chief of these, though about the middle of the seventeenth century John Milton issued his *Tractate on Education*, which demanded that the whole range of the sciences and arts should be studied in the Greek and Latin literature, and propounded this notable definition of education, namely, "I call a complete and generous education that which fits a man to perform justly, skillfully, and magnanimously all the offices, both public and private, of peace and war." By Milton's time, however, there was abroad a new spirit in education, in which he participated to some extent. This was the same spirit that was represented in philosophy by Descartes and in science by Bacon; in education the great exemplar was Comenius (q.v.). The educational influence of Comenius was (1) in broadening the conception of education beyond the narrow literary and linguistic confines until it included the whole realm of knowledge, as conceived in the popular pansophic philosophy of the time; (2) in organizing education into a definite institutional hierarchy, and systematizing its subject matter into a definite course of study, which included the elements of all the sciences, both natural and social; (3) in introducing improved methods of instruction based on conceptions, more or less erroneous, it is true, of natural processes. These ideas were embodied in a series of text-books, the most important of which was the *Orbis Pictus* (q.v.). Comenius was not alone, even in the educational field, in standing for these new ideas. Ratichius (q.v.), or Ratke, had preceded him, but had exerted little influence, owing rather to his temperamental defects than to the novelty of his ideas. Even in the preceding century Rabelais and Montaigne had led in the criticism of the prevailing educational ideas and practices, and while they had little influence on school work or little knowledge of the technique of the educational process, both opposed the extreme classicism of the time, protested against the acceptance of erudition as the aim of education, of the formal linguistic discipline as the purpose of the study of the classical literature, and held even more broadly that experience in life gave the purpose to education, so far as it was a definitely organized process. Rabelais and Montaigne were significant rather as protestants, giving an embryonic formulation to a conception of education to be further developed and made practical by such men as Comenius. The practical aspect of the Comenian movement was limited to the seventeenth century, though the line of thought was continued. In 1693 John Locke published his *Thoughts Concerning Education*, which continued the general thought of Comenius, though without recognizing the importance of a scientific rather than linguistic curriculum as might have been expected. This work of Locke has probably been of wider influence than any other treatise on education written in the English language, unless it be Herbert Spencer's *Education*. Locke emphasized the moral and physical aspects of education, in these respects exerting a profound and lasting impression on English education, both under the tutorial system which he approved and in the public schools. He had in mind the education of an English country gentleman of his time, and gave little attention to the philosophical aspect of his education. This is treated in the more general work on *The Human Understanding*, and its influence passed through the writings of the empirical school of philosophy until it reached Rousseau. Jean Jacques Rousseau (q.v.) is the most commanding educational figure in the eighteenth century. In 1762 appeared his *Emile*, which was destined to direct the current of educational thought for a century. His dominant thought was 'education according to nature,' a shibboleth which had a variety of interpretations; it meant, primarily, that the influence of human society is evil, that education should seek to eliminate all social influence, that education should shield the mind from error and the heart from evil, and this largely by isolating the child; it meant, further, that the 'nature' to be considered in education was the nature of the child, not nature in the Comenian and Baconian sense of the general processes and phenomena of the physical and biological worlds, and this is its most important educational meaning; but it also meant nature in this latter sense as well, the world of things, since it was only the education that came from things that was wholly good. This last interpretation of the naturalistic doctrine led to the complete rejection of literary and linguistic education, and in time to the organization, for elementary education, of a curriculum more suited to the needs of the child, drawn from those phases of his environment with which it came into immediate contact, such as geography, nature study, number work, and manual occupations. While Rousseau's ideas were most radical and were often stated in such paradoxical form that they provoke dissent and violent opposition, he more than all others is responsible for these fundamental conceptions of modern education: that all educational processes must start from the child's own interests and activities; that education is a process having several distinct stages, and that the subject matter and methods of education should be appropriate to each stage; that the age of adolescence is the vital period in education; that education is moral, physical, and social rather than a merely intellectual process; that knowledge of child nature in general and of the children dealt with in particular is the most important part of the equipment of a teacher; that manual labor or trades should be taught for their educational as well as for their moral and practical value.

The exaggerated, somewhat visionary, and often erroneous ideas of Rousseau were systematized and made practical during the latter part of the eighteenth century and first half of the nineteenth by groups of educators led by such men as Pestalozzi (q.v.), Herbart (q.v.), and Fröbel (q.v.). There is a wide divergence in the interests and the character of the work of these various groups, but they agree in one fundamental principle, which characterizes and unifies all their efforts and all this period of educational advance. This principle is that the 'nature' which is to control education is the nature of the child. Pestalozzi states the aim of the entire group when he says that his whole purpose is to 'psychologize education.' Pestalozzi's approach was empirical, and his efforts were wholly practical. Herbart's approach was both philosophical and scientific, though it is in this latter aspect that his influence has been permanent, through the development of the scientific study of psychological phenomena of late, in its experimental and physiological aspects. Froebel's approach was primarily philosophical through the connection of the theory of evolution with education, as seen in his *Education of Man* and *Education by Development*. However, his great influence was on the practical side, and it is for the application of these new theories of education to the first few years of the child's life by means of a new educational institution, the kindergarten (q.v.), that the name of Froebel will always stand. But whether this conception of education was stated in philosophical or even metaphysical terms, as with Kant, Herbart, and others, or in practical or empirical terms and concrete methods, the underlying conception and the general influence were the same. The psychological tendency in education was based upon a more intimate knowledge of child nature, and a study of child activities; it was characterized by a broader sympathy with childhood and child nature; it turned attention from the advanced phases of education, and centred it upon the elementary stage; it tended to break down the bookish character of education, and substituted the objective side of the child's immediate environment (see OBJECT TEACHING); it furnished a great stimulus to the movement for universal education; it concentrated educational interests in the problems of method, both psychological and practical. The beliefs of many, especially of those under the influence of Pestalozzi, were extreme in this respect. Pestalozzi's thought was that any mother, with the methods which he had formulated, could, despite no special training or knowledge, educate her own children without the assistance of books or any of the usual paraphernalia of the schoolroom. This is extreme reaction from that conception of education, dominant since the Renaissance, in which education was the acquisition of knowledge, especially linguistic and literary. Pestalozzi defined education to be "the harmonious development of all of the powers of the child," a definition which expresses the central thought of the entire psychological tendency—that education is the process of the development of the individual.

During the second and third quarters of the nineteenth century the reaction against the extreme individualism of the earlier period affected educational thought as well. In contradistinction to the psychological, this may be termed the sociological conception of education, and emphasizes the thought that education is not only the development of the individual, but that it is also the fitting of the individual to his social environment, actual and idealized, and hence that it is the development of society as well as of the individual. Auguste Comte in his *Positive Polity* (1851-54) and Herbert Spencer in his *Education* (1861) may be taken as the leaders in this movement, though Pestalozzi in his *Leonard and Gertrude*, published from 1780 to 1790, also emphasized this aspect of education. This sociological interest has centred in two points: (1) in a broader educational purpose than that expressed in psychological terms, and in this it has but put into educational terms the developing ethical, political, and social thought of the nineteenth century; (2) in a revision of the school curriculum, through the introduction of new subjects, chiefly of a scientific character, and in a modification of emphasis and organization. In its earlier stages the movement was largely a result of the expansion of the organized branches of human knowledge, and the demand made by the new professional and industrial opportunities for a wider knowledge and a training different from that afforded by the old literary education. The change in the curriculum of the colleges, as well as of elementary schools, the rapid development of institutions of the type of American high or secondary schools, of technical, manual-training, and professional schools, the introduction of the system of elective courses (q.v.) into colleges, the important position given to the various natural and social sciences, the attention devoted to the organization of all the school curricula and school systems, are all aspects of the sociological tendency.

Education as a Science. Not to be clearly distinguished from this sociological tendency is a more comprehensive view of the past decade, which has aimed to combine the essential truths of the above tendencies, and hence may be called the eclectic or scientific view. It recognizes the coördinate value of method and subject matter, of the process of the development of the mind, and of the relation of educational activities to society It avoids the controversial character of the parent tendencies, and aims rather at scientific exposition. It is based upon the results of both psychological and sociological sciences, and has influenced education rather through the more scientific formulation of the principles of method and curriculum in their mutual relations. The following definitions set forth this conception: Education is "the organization of acquired habits of action and tendencies to behavior, which shall fit him [the child] to his social and physical world"; it is the "making over of experience and giving it a more sociological value through increased individual efficiency, or better control over one's own powers"; it is "the adjustment of the child to the spiritual inheritance of the race." These three definitions, given severally by Prof. William James of Harvard, Prof. John Dewey of the University of Chicago, and President Butler of Columbia University, give the idea of the foremost leaders in educational thought in the United States at the present time. The study of education is now recognized as a science, in that it has a body of data quite as definite as that of many of the applied sciences, and as well-defined methods of dealing with such data. It is not a science in the sense of having any universally accepted group of principles as a basis of study, and in this it is in the same status as history, sociology, and most of the social sciences. Its recognition as a science has led to the establishment in most of the leading universities of departments of education of a character wholly different from that of the professional training normal schools (q.v.). Of the last importance is the influence exerted by the Government Commissioner through the Bureau of Education at Washington. Dr. W. T. Harris has by his official publications, private editorial work, and public addresses, assumed the leadership originally contemplated in the establishment of the department. As a result of this professional and scientific study of the subject the character of the teaching profession has been greatly improved, and more intelligent consideration has been given by the public to the problems of local school organization, supervision, text-books, methods, and the relations of teachers, as well as to the broader subject of education as a matter of public policy.

Bibliography. There is no more conclusive evidence of the importance and the scientific character that the study of education has assumed during the nineteenth century than the very extensive literature of the subject. A very few titles selected from this extensive list may be here mentioned; Hall (Boston, 1893), Sonnenschein (New York, 1891 and 1895), Monroe (New York, 1897), Cubberly (New York, 1902), have each published a *Bibliography of Education. The Bulletin of the Books on Education in the Libraries of Columbia University* (New York, 1901) also furnishes an extensive bibliography. There is no good encyclopædia of education in English to compare with Buisson's *Dictionnaire de pédagogie* (Paris, 1887); or Rein, *Encyklopädisches Handbuch der Pädagogik*, now in process of publication; or Schmid, *Encyklopädie des gesamten Erziehungs- und Unterrichtswesens* (10 vols., Gotha, 1886-87). Sonnenschein has published a brief *Cyclopædia of Education* (London, 1889). The nearest approach in the United States, save one or two wholly insufficient encyclopædias, is Barnard, *American Journal of Education* (Hartford, 1855-81); Appleton, *International Education Series* (45 vols., New York, 1885 et seq.); Heath, *Pedagogical Library* (28 vols., Boston, 1886 et seq.); Scribner, *Great Educator Series* (10 vols., New York, 1892 et seq.); and the *Reports of the United States Commissioner of Education* (Washington, 1867 et seq.). For the very numerous French and German works on the history of education, the reader is referred to the bibliographies given above. Among the best are those by Schmid, Schmidt, Raumer, Paulsen, and Grasberger. Raumer, *Geschichte der Pädagogik*, has been translated for the most part in Barnard, *German Teachers and Education* (Hartford, 1878). Compayré, *History of Pedagogy*, is published in translation by Payne (Boston, 1886). On ancient education the best English works are Laurie, *Historical Survey of Pre-Christian Education* (London, 1895); Monroe, *Source Book in the History of Education for the Greek and Roman Period* (New York, 1901); Mahaffy, *Old Greek Education* (New York, 1882); Davidson, *Education of the Greek People* (New York, 1894). On modern education a few of the best historical and descriptive works are the *Reports*, by Matthew Arnold (London, 1861 et seq.); the publications of Henry Barnard on *National Education* (New York, 1857-73); the volumes in the general series referred to above; Russell, *German Higher Schools* (New York, 1899); Balfour, *Educational Systems of Great Britain and Ireland* (London, 1900); and Quick, *Educational Reformers* (New York, 1890). In addition to the treatment given in the above references, the works of the following authors relate wholly or in part to theory of education: namely, Plato, Aristotle, Cicero, Quintilian, Plutarch (the discussions on education by these writers are given in selections in Monroe's *Source Book*, mentioned above), Comenius, Rabelais, Montaigne, Milton, Locke, Rousseau, Pestalozzi, Froebel, Richter, Rosmini, and Spencer. For statement of present formulation of theory, consult: Harris, *Psychologic Foundations of Education* (New York, 1898); Butler, *The Meaning of Education* (ib., 1898); James, *Talks to Teachers* (ib., 1899); Dewey, *The School and Society* (Chicago, 1899); *Ethical Principles Underlying Education* (Ann Arbor, 1894); Butler, *Education in the U. S.* (Albany, 1900). See ACADEMY; AGRICULTURAL EDUCATION; CHAUTAUQUA; CO-EDUCATION; COLLEGE (and the names of the various colleges); COLLEGES, AMERICAN; COLLEGIATE EDUCATION FOR WOMEN; COMMON SCHOOLS; DEGREE; EVENING SCHOOLS; FRÖBEL; GRAMMAR SCHOOLS; GYMNASIA AND REALGYMNASIA; HIGH SCHOOLS; INDUSTRIAL SCHOOLS; INFANT SCHOOLS; KINDERGARTEN; MANUAL TRAINING; MILITARY EDUCATION (and articles on the various schools); MONASTICISM; MONITORIAL SYSTEM; NATIONAL EDUCATION, SYSTEMS OF; NORMAL SCHOOLS; PARISH SCHOOLS; PEDAGOGY; PESTALOZZI; POLYTECHNIQUE; PROFESSIONAL EDUCATION; REFORMATORIES; SCHOOLS; SCHOOLS OF LIBRARY ECONOMY; TECHNICAL EDUCATION; UNIVERSITY (and articles on the various universities); UNIVERSITY EXTENSION.

EDUCATION, COLONIAL. A term used to indicate educational systems and practices in colonial dependencies. There is no special type either of ideas or of systems that can be indicated by this term, which consequently is used in a most general sense. However, of recent years it has become a very important phase of educational activity, since the various colonizing nations have established systems of schools as a valuable means in governing colonies and in bringing dependent peoples into closer sympathy with the home nation, or at least have accepted educational endeavor as a means of raising the standard of civilization among subject races. Previous to the nineteenth century colonizing governments took little or no direct interest in education, and such efforts as were made were wholly those of the colonists themselves or of individuals and religious bodies at home. Such efforts naturally resulted in direct imitation of institutions existing in the parent country, and find their best illustration in the American colonies of England previous to the Revolution of 1776. Here the elementary or dame school, the secondary or grammar school (q.v.), and the college were English institutions transferred to American soil, and it was not until well into the eighteenth century that these English institutions were so modified that they became schools, known as the district school, the academy, and the American college. Of these the college was most distinctly American from the first, and hence underwent the least change. Naturally, at the present time, the character of education, in the colonies of any nation, or in any particular colony of a given nation, is determined by the general character of the Colonial Government. The colonies of Great Britain, as being the furthest developed and most systematized, best present the various types. In self-governing colonies, those possessing responsible governments, the educational system is wholly under the control of the Colonial Government, and is only to a slight extent an imitation of the English institutions. Hence the educational systems of the Australian and Canadian provinces do not differ in the character of their origin or of their control from those of the States of the American Union. There is, it is true, a higher degree of central control in all of these than in the systems of American commonwealths, but this is in no wise connected with the Home Government in London. In the second class of colonies, those that possess some representative institutions, but in which the public offices are controlled by the Home Government, such as Natal and the Orange River colonies, the most important educational institutions are for the most part transplanted English institutions, modified in non-essentials to suit local conditions, supported from colonial revenues, and controlled by the home-appointed colonial officials. Profiting by earlier experiments, especially in India, more regard is now had for existing educational institutions, practices, and prejudices. Native institutions are fostered, and there usually exist the two types of schools, the English schools and the vernacular ones, the former being for the most part secondary and higher schools, to which greater attention is given. India furnishes a good illustration of this. There were in 1900 5 examining universities, 178 colleges, 6172 secondary and special schools, and only 100,965 primary schools that were supported in whole or in part by the Government. In the Crown colonies, those wholly under the control of the Home Government, a somewhat similar condition exists. English schools are established, native schools are assisted, and numerous private, especially missionary schools, are found. As in the previous class of colonies, greater attention is paid by the authorities to the English school than to the native, and consequently to secondary and higher education than to elementary. This condition, which is now being reversed, has resulted from the fact that the elementary schools have been begun largely by missionary or native effort, and the Government has followed the home policy of assisting them to some extent; while secondary and higher efforts have awaited the direct initiative and support of the Government. In 1901 the Board of Education of the British Government presented a special report of almost 2000 printed pages, giving a detailed account of education in the more important colonies.

The French Government supports schools in most of its colonial dependencies, though none of the colonies are self-supporting, few have any extensive European population, and most of them are sparsely settled or are peopled by distinctly inferior races. Algeria is excluded from this statement, since no distinction is made in education between it and the other departments of France in Europe. So far as possible, the French system of schools is extended to the colonies, but on account of the conditions mentioned above there is little demand for secondary or higher education, save of a technical or professional character, and consequently most attention is paid to elementary schools. In French India, Indo-China, Annam, Cochin-China, Tonking, Madagascar, Congo, Mayotto, Réunion, Sénégal, Guinea, and the islands of both the East and the West Indies, schools are maintained of both primary and secondary type. These secondary schools are usually normal or agricultural schools, infrequently the French Lycées.

The colonies of the German Empire have all been acquired since 1884, are sparsely settled, usually by distinctly inferior races, and are for the most part in the tropics. Hence the possibility of influencing the state of civilization by schools is slight. Besides missionary schools, the Government supports a school at Togoland, two in Kamerun, a system of 40 or 50 schools in East Africa, and a similar one in Southwest Africa. Such schools as exist in the German possessions among the Pacific islands are maintained by missionaries, both Protestant and Roman Catholic. No other country has seen the importance of education as a means of colonial rule so clearly as the United States. Hence, in the short time during which the Government has held the colonies, great progress has been made. This progress is here presented in detail.

Hawaii. When the United States Government assumed control in 1898, there was less to do in regard to educational conditions than in any of the other recently acquired island territory, and less to do in regard to education than in almost any other aspect of Hawaiian conditions. In fact, the educational status of Hawaii is better, as regards illiteracy and school attendance, than in many States of the Union. The existing Government, then, has simply continued the established system and maintained its high standard. This exceptional condition, however, is largely due to the influence of Americans exerted over a long period. By the earliest missionaries in 1820 the natives were taught the alphabet, and many of them learned to read English before their own language was reduced to a written form. Within four years 2000 people had learned to read, a system of public schools had extended over the islands, and so great was the early enthusiasm that a large part of the population was in attendance. A seminary for the training of teachers, which still exists, was established in 1831; in 1833 the Oahu Charity High School, which has since become the Honolulu High School, was founded, followed in 1836 by a boarding-school for boys, and in 1839 by an industrial training-school. The Royal School for chiefs, founded in 1840, and since become a school for all Hawaiian boys, was the chief school for the teaching of English. Numerous other mission schools sprang up from time to time, and in 1839 the Roman Catholic missionaries established a system of schools. The first comprehensive system of laws was published in 1840, and these laws include a number of educational provisions. Most important of all was a compulsory attendance law, with penalties for both parents and children for non-compliance, while it was further stipulated that no illiterate man or woman should "hold office over any other man," nor could any illiterate person marry. The office of Minister of Public Instruction was established, the first incumbent being Richard Armstrong, father of Gen. S. C. Armstrong, of the Hampton Institute. In 1855 a Board of Education was substituted for the Minister of Education, and since 1865 an inspector-general of schools has been appointed. The use of English has become all but universal, so that now more than 98 per cent. of those attending school are instructed in English. All public schools were made free in 1888, since which time such schools have increased their attendance at the expense of the private schools until at present they educate more than two-thirds of the population. Owing to the decrease in native population, the absolute number of Hawaiian children in the schools has decreased one-half in the last fifty years. In 1903 the school attendance was 18,415, divided as follows: Hawaiian 4893, part Hawaiian 3018, Americans 799, British 217, Germans 295, Portuguese 4243, Scandinavians 194, Japanese 2521, Chinese 1554, other foreigners 115. Of the 633 teachers, 150 were Hawaiian, 82 part Hawaiian, 327 Americans, and the remainder of various nationalities. The total number of public schools was 144 and of private 59, for a total population of 154,000. According to the report of 1903, the governmental expenditure for popular education was $599,305.14, almost as liberal per capita expenditure as that in the United States.

The Philippine Islands. At the time of the American occupation, there was a Spanish law requiring two school-teachers for every 5000 of population, though in reality there were at the opening of hostilities between the Spaniards and Americans only half that number. In 1897 the Spanish statistics showed 2167 public schools for about 6,000,000 population. Education was almost wholly under the supervision of the friars, and schools were held either in Church property or in the house of the teacher. The public school system was widely diffused throughout the Archipelago, when the Americans arrived. The course of instruction consisted of Christian doctrine, reading, writing, arithmetic, Spanish, geography, Spanish history, practical agriculture, the rules of deportment and vocal music. The percentage of natives who could read and write varied greatly in different localities, in some instances being high and in others low. There existed a class of the native population that was highly educated and very intelligent. The University of Manila had an attendance of more than 1000 in 1896, and in the period from 1800 to 1882 had graduated 2392 students. In the public colleges or secondary schools of the island there was a total attendance of 8070 in 1896, and in addition 1915 in 67 private Latin schools. During the first two years of American control of the islands, little attention was paid to education, but on March 30, 1900, a department of education was established under charge of Capt. Albert Todd. For five months the schools thus remained under military control. Whenever practicable, soldiers were detailed to assist in giving instruction in English. books and supplies were furnished, and efforts were put forth to continue the native schools after the Spanish system. Little, however, was or could be accomplished. On September 1, 1900, Dr. Fred W. Atkinson assumed office as the first General Superintendent of Public Instruction for the Philippine Islands. The Philippine Commission adopted a general plan for education recommended by the Superintendent, which became a law January 21, 1901.

This law established a department of public instruction that should have control over all schools of public or semi-public nature. It provided for an executive head of the department, with an annual salary of $6000; for eighteen division superintendents of schools at salaries of from $2000 to $2500 per annum; for 1000 teachers of English from the United States, at salaries of from $900 to $1500; and for the establishment and maintenance of normal, agricultural, and manual-training schools. A general appropriation of $400,000 for the first year was made for the construction and equipment of buildings, and of $220,000 for the purchase of text-books and school supplies. The law established a municipal council of four to six members, who should have duties corresponding to those of local school boards in the United States; and also a superior advisory board of education, to be composed of the General Superintendent of Public Instruction as president, and four members to be appointed by the Philippine Commission. The duties of this board are largely of an advisory nature, but investigations are to be conducted by them and recommendations made to the Commission.

The system of schools as now being organized contemplates free elementary schools throughout the islands, with the probability of a compulsory education law; free high schools in each of the forty or more provinces; a normal, trade, and agricultural school in the northern, central, and southern portion of the archipelago; and finally a university located at Manila, to include literary, scientific, medical, commercial, and engineering departments. The plan of administration of the elementary school calls for a ten-months' school year, with four hours of instruction daily, and one hour's normal instruction for the native teachers. In addition, during each summer vacation a four-week normal session for the native teachers is to be held in each provincial capital, under direction of the American teachers. In the summer and fall of 1901 almost 1000 American teachers arrived, and were assigned work throughout the islands in places determined by local needs and safety, while at the same time more than 120 of the former soldier teachers were retained. During the first year more than 100,000 pupils and 5000 Filipino teachers were enrolled in the day schools, and 20,000 adults received instruction in the evening schools. By the close of 1903 there were 2000 elementary schools in the islands, with 723 American and 3000 native teachers, and 150,000 pupils. Instruction was given wholly in English and from English texts. In addition to the Spanish-English text-books, which cannot have very extensive use, Visayan-English and Tagalo-English readers and grammars are being supplied the schools. Many improvements in administration have been made, such as better grading of pupils, individual in place of concert recitation, the establishment of silent study for the old custom of studying aloud, and especially the change wrought in hygienic conditions. However, the chief work of the American administration of schools is to bring about a better spirit between the two peoples; and this is being done by the establishment of friendly relations between the American and the Filipino teachers, pupils, and parents. Grave doubts are expressed of the possible success of the plan to introduce the English language. At least the mistake made by England in India, of concentrating efforts on higher education, is being avoided, and all efforts are centred in reaching the masses through the common school.

Porto Rico. The educational conditions in Porto Rico constituted one of the most serious elements in the situation which the Americans had to face on the assumption of control in the island in 1898. Excellent legal provisions for schools, including free tuition and compulsory attendance, had existed for many years, but for the most part these provisions had been dead letters. The excellent reforms in education introduced by the Spaniards in 1880 had been non-effective, and political and social conditions forbade any progress and prevented any interest in such affairs. These conditions had been made much more critical at the time of the American occupation by the social and governmental disorganization incident to the war, and by the hurricane, which had destroyed most of the little interest the people had in schools, along with all ability to contribute to their support. Moreover, such interest as the people had had for generations was in the education of the upper classes, and consequently in higher and secondary rather than elementary education. A few institutions of this higher grade existed, the most important of which were a collegiate institute, founded in 1880, with an attendance of 60; a normal school for girls, with an attendance of 50; and an industrial school for instruction in trade, with an attendance of 312. The methods of instruction and the management of the institute and normal, however, were so defective that, after investigation, these institutions were suspended by the American authorities, and other provisions made for carrying on such work. There were at that time, and still exist, a number of private colleges and academies, which for the most part are under religious control. One of these private institutions, La Sociedad Protectora de la Inteligencia, has for its object the sending of poor young men who have distinguished themselves in the examinations to the United States or Spain to complete their studies. The last Spanish statistics, three months before the Americans took possession, showed a total of 555 schools, all but 26 of which were public. Of these 380 were for boys and 148 for girls. The total enrollment in public schools was 25,644, with an attendance of 18,243. The attendance on private schools was 980. This was out of a population of almost 900,000, of whom 300,000 were of school age. The entire population showed by the American census an illiteracy of 83 per cent.

In May, 1899, six months after the Americans assumed control, Gen. John Eaton, formerly Commissioner of Education for the United States, was appointed Director of Public Instruction, and an order was issued by the Military Government for the reorganization of the entire system. An insular board of education of five members was created, the president of which was to be insular superintendent of education. The order divided the island into school districts, somewhat like those in the United States, provided English supervisorships, prescribed the manner of electing local school boards, established fines for non-attendance to duty on the part of the boards, and provided for district school taxes and the issuance of bonds. The municipalities were required to furnish buildings or quarters for the schools, distinct from the residences of the teachers. The schools were graded, a six-year course of study prescribed, the qualification of teachers defined and their salaries fixed, free text-books provided for, and a high school, a normal school, and a professional school organized. Coeducation was not required, but was encouraged; and in the country districts where no provisions existed for the education of girls, it was provided that, upon request of parents, girls should be admitted.

While the law met with no opposition so far as internal administration was concerned, to a great extent it proved inoperative; for there was little or no response on the part of the local committees, and out of 800 towns of the island, fewer than 20 made any attempt to effect a local school organization. Nevertheless, as a result of the influence of the military authorities, within five months there were more schools in operation than ever before, and a larger proportion of the school population receiving instruction. In June, 1897, there were 212 town schools and 313 country district schools in operation, with 426 country districts yet unprovided for. But out of a school population of 297,812 only 29,172 were enrolled, and 21,873 in actual attendance, leaving more than 268,000 without school facilities. At the close of the following school year, however, the number of schools had risen to 800, of which 409 were in rural districts. These schools accommodated 9000 additional pupils. The General Government also supplied all text-books free of expense to pupils and local boards. More than 100 American teachers were employed in the schools, and half that many native teachers were sent to the United States for the purpose of acquiring the language and some training in methods of instruction. Training and industrial schools have been established in the three most important cities.

The greatest difficulty is the question of financial support. The military authorities raised the proportion of the public expenditures devoted to education from 6 to 12 per cent., but if the entire general revenue of the island had been appropriated for school work it would have been insufficient to offer instruction to all the illiterate youth of the land. Only very gradual improvement can be expected if no outside assistance is given to the island.

Cuba. The educational status of Cuba, at the time of the American intervention, was very similar to that of the other Spanish dependencies. There existed an excellent legal system, while the actual conditions were very deplorable. Such interest as existed was in reference to higher education, and admirable provisions were made for the more intelligent and wealthy classes. The University of Havana and a large number of secondary schools under private or religious control had been attended by large numbers of this class. The public schools were nominally free, but really depended on the tuition of pupils, and consequently were patronized only by the well-to-do.

The system in force in 1899 was based on the law of 1865 as modified by that of 1880. Every town of 500 inhabitants was required to support one elementary school for boys, and one, though incomplete, for girls; towns of 2000 inhabitants, two schools for boys and two for girls; and for every 2000 increase in population there was to be one additional school for each sex. This additional number was to include private schools, though at least one-third of all schools must be public. Secondary schools and kindergartens were provided for in cities of over 1000 population, and a normal school for the capital of each province. An admirable course of study was prescribed, but its actual administration and the text-books used were under the inspection of the Catholic clergy. Attendance on either public or private schools was compulsory for all Spanish children from 6 to 9; the teachers in public schools were to be Spaniards. However, the municipalities had ceased, if they had ever done so, to pay any particular attention to these laws; no funds were voted, teachers were not paid, and their meagre revenue was drawn largely from tuition. The per cent. of illiteracy under the American census taken in 1899 was 63.9 per cent. The latest Spanish school statistics were for the year 1893, two years previous to the outbreak of the last revolution. They show 35,000 children receiving instruction in the entire island in 898 schools. During the revolution most of these schools ceased to exist, if they had ever existed before. Those outside of provincial capitals and garrisoned towns were closed by order of the Governor-General. The autonomous Government issued an edict reëstablishing the schools in 1898, but their actual condition remained much as it was throughout the revolution at that time until a year after the American occupation, though there were said to be about 200 schools with 4000 pupils throughout the whole island.

On December 6, 1899, the American Military Governor issued an order reorganizing the elementary and secondary school system of the island. It provided that there should be a board of education in each municipality, with the mayor as president, who should appoint the other members, and that there should be one public school for boys and one for girls in every town of 500 inhabitants, the number increasing with the size of the town. In smaller towns 'incomplete' schools were to be established. It also provided for compulsory attendance, for the payment of tuition, for the inspection and superintendence, for free text-books, and other details. The course of study was prescribed by the superintendent of schools. By March, 1900, there were 3099 schools, with 3500 teachers and 130,000 pupils. In the fall of 1901 there were 250,000 pupils, with almost 4000 teachers. Most of these children are in the first three grades, though a very small number are far enough advanced for the work of the fourth and fifth grades. This fact indicates the deficient conditions existing before 1900, for the age of the pupil is no indication of his stage of advancement.

One important phase of the American influence was the improvement of the teaching body. Summer normal schools were founded, which for two years have furnished instruction to about 4000 teachers for a period of six weeks. During 1900 more than 1400 Cuban teachers attended the summer session of Harvard University, special provision having been made by that institution for their maintenance and instruction. Recognizing that permanent improvement must come from constant contact with more advanced sources outside the island, the Cuban Government is now supporting sixty women teachers at the State Normal School at New Paltz, N. Y., with the understanding that these teachers are to continue their services in the public schools for a term of years upon their return. With a similar motive, the Cuban Educational Society, receiving its support from many prominent public officials and business and professional men of the United States, maintains some 40 or 50 youths in American colleges, with the expectation that they will return to advance the educational interests of the island. In similar ways more than 1500 Cuban and Porto Rican boys are now being educated in the United States, all under obligation to return to their homes on completing their schooling. Another important phase of the work is the supply of school material and school buildings. There was not one building on the island at the American intervention that had been constructed for or was used for public school purposes. There was little or no school furniture, and the books were of the most antiquated character. The American administration has devoted a great deal of effort and more than $400,000 to secure inhabitable school buildings. More than 100,000 school desks and other appliances in proportion were purchased and distributed throughout the island. Text-books of modern standards were prepared and published by order of the education department of the Government, and supplied for the first four grades throughout the island. The changes thus made will have a marked effect upon the illiteracy of the population; and an educational system, modern in spirit and method, and almost universal in the opportunities it offers, was thus turned over to the Cuban people when they took charge of their own Government.

Two conditions are apt to interfere to some extent with any great immediate development or even the maintenance of these standards. In the first place, all the American administrative functionaries, save one, have been withdrawn, and political influence is apt to interfere to some extent. In the second place, the American administration devoted a larger proportion of the revenues of the Government than the native direction possibly can; and the necessities for school expenditures are apt to increase more rapidly than the general wealth of the island. The excellent results so far produced may become permanent, however, if the efficiency of the schools is maintained even though their number decrease. The report for the year 1903-4 shows that there has been little diminution in the number of schools or in the amount of school expenditures and a falling off of only 6000 in the school enrollment. For the fuller treatment of the educational status of all these islands, consult *Report of the United States Commissioner of Education*, 1898-99, and 1899-1900. Consult, also, *Special Report on Educational Subjects*, vols. iv. and v., issued by the British Board of Education (London, 1901). See CUBA; HAWAII; PHILIPPINES; PORTO RICO.

EDUCATION, COMMERCIAL. Recent experience and discussion are giving to commercial education a meaning as exact as are the terms 'classical' and 'technical' when applied to schemes of instruction. Confusion has arisen in dealing with this subject from the failure to distinguish between two different but perfectly legitimate senses in which the words are used. Commercial education may mean general education along modern lines, with a minimum of technical instruction, and, at the most, fairly preparing students for an intelligent apprenticeship in business pursuits. In this sense commercial schools are to the business world what manual-training schools are to the industrial world. Public commercial high schools, as they are being established in the United States, are in the main of this kind. Such training conforms to the European use of the term in that they give "a general education of such a nature as shall best fit youths for commercial pursuits." In another sense, commercial education is applied to the training given in technical schools corresponding to trade schools or schools of technology. Such institutions give a maximum of technical instruction; they are made familiar by the American business college, but are further represented by higher schools and universities of commerce in both this country and Europe. The latter schools build at least on the general education of the secondary school. Higher commercial education has probably been best defined by the authorities of the London School of Economics: it is that "which stands in the same relation to the life and calling of the manufacturer, the merchant, and other men of business as the medical schools of the universities to that of the physician—a system, that is, which provides a scientific training in the structure and organization of modern industry and commerce, and the general causes and criteria of prosperity."

COMMERCIAL EDUCATION IN EUROPE. Germany may well be termed the home of commercial education. Special instruction along commercial lines was provided in Saxony in the eighteenth century. Well-organized commercial schools became a feature of German education in the nineteenth century; in 1898 a commercial university was established at Leipzig. The Superior School of Commerce at Paris was founded in 1820, and continued to have a precarious existence under private management until 1869, when it was taken in charge by the Paris Chamber of Commerce. Commercial academies and schools have long been established in several other Continental cities, among them being Vienna, Venice, and Antwerp. England has provided for higher commercial instruction at the London School of Economics and Political Science, at Victoria University and at Liverpool, and plans are now formed for an elaborate scheme of such education at the new Birmingham University. Both England and the Continental countries have established schools that give commercial work of an elementary and rather technical character.

Commercial schools in Europe are of three types: (1) Higher—e.g. at Leipzig, Frankfort, Cologne, Paris, Antwerp, London, etc. Colleges and universities of commerce now being established in the United States correspond fairly to these schools. (2) Middle schools, academies, and the like, having usually a scheme of studies for three years, though some have four-year and others only two-year courses. These schools take students at about the ages at which they enter American high schools, and give them an education more technical than is furnished in our high schools of commerce. (3) Some form of day or evening continuation school for those who are already serving apprenticeships in business pursuits. Chambers of commerce and other organizations of business men have in some cases assumed entire charge of commercial schools in Europe; in other cases the control has been by public or private authority alone; but a more common procedure is for business men to exercise some influence by serving on boards of control, supervising examinations, meeting deficits, etc.

COMMERCIAL EDUCATION IN THE UNITED STATES. The first clearly defined form of commercial instruction in this country was that of the business colleges, which took their rise a little before the middle of the nineteenth century. Early in the eighties the Wharton School of Finance and Economy was established in the University of Pennsylvania (q.v.), and about the same time public high schools began to give work similar to that of the earlier business-college instruction. From this time the development of commercial education has been rapid. At present the universities of Pennsylvania and Wisconsin offer a full four years' college of commerce course, on the completion of which a baccalaureate degree is conferred. Partial courses in commerce are also offered, either as free electives, or for the last year or two years of undergraduate instruction, as at the universities of Illinois, Michigan, Chicago, California, Vermont, and at Dartmouth College. Of necessity this list is incomplete, since plans of study of a commercial nature are being introduced into colleges and universities in every part of the country.

The growth of secondary schools of commerce has been more rapid than that of the colleges. Independent high schools devoted to commercial education are now in existence in New York, Philadelphia, Washington, Pittsburg, and other cities, while commercial departments and elective commercial studies are well-nigh universal in high schools of the country. The private business colleges are as well patronized as ever, and hundreds of thousands of young people are at present receiving a commercial education in the United States.

Associations and Journals. For nearly ten years the Business Education Section has been conducted as one of the departments of the National Educational Association. Sessions are held annually in connection with National Association meetings, and the proceedings are printed in the Association's report. Many other associations are active in this country, the best-known of them being the National Federation of Commercial Teachers and the Eastern Commercial Teachers' Association. In England there is the "Yorkshire Association for the Promotion of Commercial Education," and in Germany the "Deutscher Verband für das kaufmännische Unterrichtswesen." Most important, perhaps, of all the societies is the International Association for the Advancement for Commercial Education. Among special journals are the *Zeitschrift für das gesamte kaufmännische Unterrichtswesen*, published by Teubner, in Leipzig, and the *Practical Educator*, published in Columbus, Ohio.

Consult: Zeiger, *Handelsschulgedanken im 18. Jahrhundert* (Dresden, 1900); Stegemann, *Kaufmännisches Fortbildungsschulwesen* (Brunswick, 1896); Léautey, *L'enseignement commercial et les écoles de commerce en France et dans le monde entier* (Paris, Librairie comptable et administrative); James, *A Report on Education of Business Men in Europe* (1893); James, *Commercial Education in the United States* (Monographs on Education for Paris Exposition, Albany, N. Y., 1900); Hooper and Graham, *Commercial Education at Home and Abroad* (London, 1901); Ware, *Educational Foundations of Trade and Industry* (New York, 1901); Sadler, *Higher Commercial Education at Antwerp, Leipzig, Paris, and Havre* (London, 1898; Special Reports on Education, vol. iii.); Sadler, *Recent Developments in Higher Commercial Education in Germany* (same series, vol. ix.); Hartog, *Commercial Education in the United States* (same series, vol. xi.); Hooper and Graham, *Commercial Education at Home and Abroad* (New York, 1901); Herrick, *Meaning and Practice of Commercial Education* (New York, 1904); *Report of the Commission on Industrial and Technical Education* (Boston, 1906).

EDUCATION, Commissioner of. The chief officer of the Bureau of Education, at Washington. He is appointed by the President and Senate, and his duties are "to collect such statistics and facts as shall show the condition and progress of education in the several States and Territories"; to diffuse such "information respecting the organization and management of schools and school systems and methods of teaching as shall aid the people in the maintenance of efficient school systems, and otherwise promote the cause of education"; and also "to present annually to Congress a report embodying the result of his investigations and labors, together witn a statement of such facts and recommendations as will, in his judgment, subserve the purpose for which the department is established." The office was established in March, 1867. The incumbents have been Henry Barnard, 1867-70; John Eaton, 1870-86; Nathaniel H. R. Dawson, 1886-89; William T. Harris, 1889—.

EDUCATION, Compulsory. See National Education, Systems of.

EDUCATION, Military. See Military Education.

EDUCATION, National Systems of. See National Education, Systems of.

EDUCATIONAL ASSOCIATION, National. A society of teachers and educators organized as the National Teachers' Association at Philadelphia, Pa., in 1857, and incorporated under its present name in the District of Columbia in 1886. The aid which associated teachers might render to the progress of education was recognized in the United States early in the nineteenth century and a number of such societies were formed, though of somewhat limited scope. Perhaps the best known of these, the American Institute of Instruction, organized in 1830, confined its work to New England; a similar society in the West, the Western College of Teachers, was organized in Ohio in 1831; the American Association for the Advancement of Education was founded at Philadelphia in 1849, and there were, besides, numerous State educational societies. In 1856, however, a call was issued by the presidents of twelve of the State societies, for a general association of national extent to "advance the dignity, respectability, and usefulness" of the teaching profession, and to develop educational science "by distributing among all the accumulated experiences of all." The society thus initiated grew slowly and did not gather large effectiveness until its work began to be specialized in 1870. In that year combination was made with the American Normal Association and the National Superintendents' Association, and departments were instituted of higher and elementary instruction. Other sections were then rapidly inaugurated so that the association at present includes the National Council, an advisory body, and seventeen departments devoted to the special problems of method, organization, and the courses of study in nearly every type and grade of educational work. At their annual meetings held in different parts of the country the society gives large space to specialized and concrete discussions in the several departments. These proceedings, together with those of the society as a whole, published in the *Annual Reports*, constitute the most important body of pedagogical literature in the country. In 1892 a committee of ten was appointed to report upon the curricula of secondary schools. This report, insisting upon greater intensity and coherence in school work, and upon the more intimate correlation of studies, exercised wide influence, and its conclusions were very generally adopted. Other reports exercising an influence hardly less wide were those of the committees on elementary schools (1895), on rural schools (1897), on college entrance requirements (1899), on normal schools (1899), and on public libraries and public schools (1899). The active membership of the society is some ten thousand, but the annual meetings are usually attended by more than that number, the larger proportion being associate members. The meeting and exchange of opinions of teachers from all sections of the country has contributed largely toward unifying educational procedure and in developing an approximately even system of educational theory. Several of the leading educators of the country have taken an active interest in the association's welfare. Among these may be especially mentioned Nicholas Murray Butler (q.v.) and William T. Harris (q.v.). See *History of the National Educational Association of the United States* (Washington, D. C., 1892); the reports of the *Committee of Fifteen*, the *Committee of Ten*, etc.; the *Proceedings of the Department of Superintendence of the National Council;* and the annual volumes of the *Proceedings of the National Educational Association* (Washington, D. C.).

EDWARD, or EADWARD (?-925). A king of the English, known as the Elder. He was the son of Alfred the Great, and succeeded his father in October, 901, having previously distinguished himself in the wars with the Danes. His cousin, Ethelwald, who disputed Edward's right of succession, was killed in battle in 905. After twenty years of fighting, Edward subdued the north as far as the Humber, and was recognized as overlord by all the other kings in the island. Consult Green, *The Conquest of England* (London and New York, 1883).

EDWARD, or EADWARD (c.963-79). A king of the English, known as the Martyr. He succeeded his father, Edgar, in 975, at the age of twelve. His succession was disputed in behalf of his half-brother, Ethelred, a child of seven; but the powerful influence of Saint Dunstan decided the contest in favor of Edward. He was assassinated in 979, at the instigation probably of his stepmother, Ælfthryth, who was disappointed at her failure to gain the crown for her son Ethelred.

EDWARD, or EADWARD (c.1004-66). King of the English from 1042 to 1066, known as the CONFESSOR. He was the elder son of Ethelred the Unready, and was born at Islip, in Oxfordshire, about the year 1004. On the death of Edward's father in 1016, followed soon after by the death of Edmund Ironside (q.v.), Canute, the Dane, obtained possession of the throne, and, in the following year, married Emma, the mother of Edward, by whom he had a son named Hardicanute or Harthacanut. Until the death of Canute in 1035, Edward lived in Normandy. Then he made an ineffectual attempt to establish his authority in England, but his mother, Emma, sided with her younger son, Hardicanute, who, on the death of Harold, his half-brother, in 1040, became sole ruler of the English kingdom. Hardicanute probably invited Edward to England, where he was honorably received. On the death of Hardicanute in 1042, Edward was elected King. The person chiefly instrumental in bringing about this result was Earl Godwine, whose only daughter, Edith, or Eadgith, became Edward's wife in 1045. For a number of years the reins of government were practically in the hands of Earl Godwine and his sons, who were powerful enough at times openly to impose their will upon the King. Edward himself showed little inclination for the affairs of government, and his mild disposition and ascetic temperament made him as little sensible to the attractions of worldly power as to the charms of his beautiful wife. His life was passed for the greater part in holy works, his most lasting monument being Westminster Abbey, which he caused to be built. He died January 5, 1066. The honor of canonization, and the title of Confessor, were conferred on him in 1161 by Pope Alexander III. The whole of his reign is simply the record of the growth of the Norman, or court party, and its struggle with the National or Anglo-Saxon party—for an account of which, see GODWINE and HAROLD. Wars with the Welsh, in 1057 and 1063, and with the Northumbrians, in 1065, were short and successful. Consult Freeman, *The Norman Conquest*, vol. ii. (Oxford, 1877); this gives the fullest and best account of Edward's reign. See ANGLO-SAXONS.

EDWARD I. (1239-1307). King of England from 1272 to 1307. He was the eldest son of Henry III. by his wife Eleanor of Provence, and was born at Westminster, June 17-18, 1239. In 1252 his father bestowed upon him the lordship of Gascony, and in 1254, on his marriage to Eleanor of Castile, he received, as an additional gift from his father, Ireland and Wales, and the towns of Bristol, Stamford, and Grantham. In his early years he was surrounded by foreigners, and was guilty of many injudicious and some cruel actions. The misgovernment of Wales by his officials led to a revolt in which the Welsh allied themselves with the Scotch. A dangerous war followed, which brought to a head the general discontent which prevailed in England over the bestowal of great offices of State upon foreigners, and the King's subserviency to the see of Rome. The Provisions of Oxford (q.v.), greatly limiting the power of the Crown, were drawn up by Parliament, and both Edward and his father were compelled to swear to observe them. Edward, however, used the opportunity afforded by the divisions among the nobility to place himself at the head of the party of the lesser nobles, who were opposed to the great barons. War broke out in 1263. There were many indecisive engagements, until Edward was taken prisoner after the battle of Lewes (1264). He escaped in May, 1265, and on August 4th won a complete victory over his opponents at Evesham. The resistance of the barons, nevertheless, dragged on until July, 1267. The defeated were treated with great moderation, and Edward showed by prudence and wisdom that he had outgrown the faults of his youth. In 1268 he assumed the Crusader's cross, and in 1270 set out to join Louis IX. of France on his crusade. Louis died on the coast of Africa, and the French Crusaders made peace with the Mohammedans; but Edward persisted in the enterprise, and landed at Acre in 1271. Nothing, however, of any consequence was achieved, and in the following year he set out on his return to England. In Sicily he heard of his father's death (1272), but did not hurry home. In 1273 he proceeded to France, and did homage to Philip III. for his French possessions. He arrived in England, August 2, 1274, and, with his Queen, Eleanor, was crowned at Westminster on August 19th. His first military expedition after his accession to the throne was directed against the Welsh. After an intermittent contest of nearly ten years—in the course of which the famous Prince Llewllyn (q.v.) was slain at Radnor, December 10, 1282—Wales was finally subdued and incorporated with England.

Edward's great ambition was to gain possession of Scotland. The death, in 1290, of Margaret, the Maid of Norway, granddaughter of Alexander III., who was to have been married to Edward's son, seemed for a time to have frustrated his design; but the selfishness of the competitors for the Scottish crown induced them to acknowledge Edward as Lord Paramount of Scotland, each hoping that he would thereby secure the English monarch's support. John Baliol and Robert Bruce were also foolish enough to make him umpire between them; or perhaps it would be more correct to say they were not powerful enough to refuse his arbitration. At Berwick, November 17, 1292, Edward decided in favor of John Baliol, who immediately took the oath of fealty to him, and on December 26th did homage to the English King for his crown at Newcastle. The patriotism and pride of the Scottish nation took fire at such humiliation, and in a short time Baliol was hurried by his subjects into a war with England. In 1296 Edward entered Scotland, devastating it with fire and sword. He penetrated as far north as Elgin, compelled Baliol to resign the throne, and governed the country by means of a board of regency. It was during this expedition that he carried off from the Cathedral of Scone the celebrated stone on which the kings of Scotland used to be crowned, and which is now in Westminster Abbey. A second rising took place in Scotland in the following summer. The leader on this occasion was William Wallace. He was completely successful for a time, chiefly, it is supposed, on account of the absence of Edward. In the spring of 1298, however, that sovereign again made his appearance in Scotland, and gave battle to Wallace at Falkirk, on July 22d. Partly through treachery, and partly, no doubt, through the superior generalship of Edward, who is considered to have been the first military commander of his time in Europe, the Scottish forces were entirely defeated. The next five years were spent by the English in reducing the country to obedience—with very imperfect success, however. In the summer of 1303 Edward led a third army into Scotland, and once more spread havoc and ruin to the shores of the Moray Firth. The last castle that held out against him was Stirling, which did not yield until July 24, 1304. Some time after this Wallace either fell into his hands or was betrayed, and on August 23, 1305, was executed. In the beginning of 1306 Robert Bruce, Earl of Carrick, grandson of the chief rival of Baliol, suddenly left the English Court, unfurled once more the banner of Scottish independence, and on March 27th of that year was crowned at Scone. An English army under the Earl of Pembroke was immediately dispatched to Scotland, and at the close of the year the King himself set out to chastise Bruce. But Edward only lived to reach Burgh-on-Sands, a village beyond Carlisle, where he expired July 7, 1307, "in sight of the country," says Lord Hailes, "which he had devoted to destruction."

As a ruler Edward is entitled to the highest praise. Immense progress was made during his reign in the establishment and improvement of law and order throughout the land, in the reformation of civil abuses, and in the restriction of the ecclesiastical power. He has been called the English Justinian, and both Hale and Blackstone affirm that "the very scheme and model of the administration of common justice between man and man was entirely settled by this King." Ireland and Wales participated in the benefits of English law. It was during Edward's reign, too, that the representation of the Commons of England first became regular; but probably the greatest advantage obtained by the nation was the declaration that the right of levying taxes resided in Parliament. In general, it may be said that Edward ruled in harmony with the ideas and desires of the best heads among his nobles and burgesses; and though touchy on the question of his prerogative, like every Plantagenet, and cruel in his treatment of the Jews, he must be regarded, on the whole, as one of the most enlightened and sagacious monarchs of his age. Consult: Stubbs, *Constitutional History of England*, vol. ii. (Oxford, 1874); id., *The Early Plantagenets* (London and New York, 1877); Prothero, *Simon de Montfort* (London, 1877); Tout, *Edward I.* (London and New York, 1893); Jenks, *Edward Plantagenet* (New York, 1902); Tout, *Edward the First* (London. 1903).

EDWARD II. (1284-1327). King of England from 1307 to 1327. He was the son of Edward I., and was born at Carnarvon, April 25, 1284. In 1301 he was created Prince of Wales, being the first heir apparent to the English throne who bore that title. He accompanied his father on his expeditions into Scotland; but after the death of the latter he abandoned the personal conduct of the war and returned to England. At home Edward's mode of life was contemptible. While still a youth he had conceived an extraordinary admiration and fondness for a witty, clever, but dissolute courtier called Piers de Gaveston, the son of a Gascon knight. After Edward became King there was no limit to the honors heaped on the favorite. When the King went to France, in the beginning of 1308, to conclude a marriage with Isabella, daughter of Philip the Fair, Gaveston was left as guardian of the kingdom. The nobles were indignant, and demanded his banishment. Twice Gaveston was forced to leave England, but as often he was recalled by the weak monarch, whose love for him amounted to sheer infatuation. At last the nobles rose in arms, besieged Gaveston in Scarsborough Castle, and, having forced him to surrender, hanged him June 19, 1312. Two years after this Edward invaded Scotland at the head of a great army, amounting, according to some historians, to 100,000 men. At Bannockburn, on June 24, 1314, he was encountered by Robert Bruce (q.v.) and defeated with immense slaughter. Finally, in 1319, after numerous petty successes on the part of the Scotch, Edward concluded a truce with them for two years. Once more he fell under the influence of unscrupulous favorites, the persons elected on this occasion being the two Despensers. Once more the nobles rebelled, and both Hugh le Despenser and his father were banished, in July, 1321; but some months after they were recalled by Edward. Many of the rebellious nobles, among others the Earl of Lancaster, were beheaded in the following year. Immediately thereafter Edward invaded Scotland for the last time; but having achieved no success, concluded a truce with that country for thirteen years and returned to England. A dispute now arose between him and Charles IV. of France, brother of his wife, Isabella, in regard to the territories which the English King held in that country. When Charles seized the lands in question, Edward sent over Isabella to remonstrate, and, if possible, to effect an amicable arrangement between them. Isabella, it would appear, despised her husband and disliked the Despensers. Meeting at the French Court many English nobles who had left their country to avoid the enmity of the favorites, she was easily induced to make common cause with them against her husband and the Despensers. She obtained possession of the young Prince of Wales (afterwards Edward III.), and landed at Orwell, in Suffolk, September 24, 1326. The Queen and the banished nobles were soon joined by all the influential persons in England. Edward fled, but was taken prisoner. The Despensers, father and son, were executed, and the monarch himself, after being formally deposed by Parliament, January 20, 1327, was murdered in Berkeley Castle on September 21st of the same year. He left two sons and two daughters. Consult Stubbs, *Constitutional History of England*, vol. ii. (Oxford, 1874). See BANNOCKBURN; DESPENSER; GAVESTON.

EDWARD III. (1312-77). King of England from 1327 to 1377. He was the son of Edward II., and was born at Windsor, November 13, 1312. He was chosen King by Parliament on January 14, 1327, six days before a formal resignation was extorted from the unhappy Edward II. (q.v.). During his minority the country was governed nominally by a council, but in reality by the Queen-mother, Isabella, and her lover, Mortimer. On January 26, 1328, Edward married Philippa, daughter of the Earl of Hainault. Two years later, resolving to take the power in his own hands, he seized Mortimer, put him to death, November 29, 1330, and banished his mother to her house at Rising, where she was kept until her death. In 1333 Edward, claiming that the Scots had violated the truce between the two countries, invaded Scotland. A bloody battle was fought at Halidon Hill, near Berwick, July 19, 1333, in which the Scots were completely defeated. Edward Baliol was restored to the throne, and surrendered part of his kingdom to Edward. In the course of three years Edward thrice invaded Scotland; but though he laid the country waste and brought armies with him that effectually crushed all opposition, he could not break the spirit of the people. The scene of Edward's great exploits, however, was France. As all the sons of Philip the Fair had died without male heirs, Isabella, his daughter, claimed the Kingdom of France for her son Edward. Most French authorities, however, held that the crown could descend only in the male line, and accordingly Philip VI. (q.v.), the nephew of Philip the Fair, was recognized as King. For several years hostilities were averted; but when France, in 1337, interfered to aid Scotland, Edward declared war against France. This was the beginning of the Hundred Years' War. The early conflicts were of little importance; but in 1346 Edward, accompanied by his eldest son, the Black Prince, made a new invasion of France, conquered a great part of Normandy, marched to within a few miles of Paris, and on August 26 of that year inflicted a tremendous defeat on the French at Crécy (q.v.). Here Edward, the Black Prince, though only sixteen, exhibited the courage and prowess of a veteran. After some further successes, such as the reduction of Calais, a truce was concluded between the two nations for nine months. Meanwhile the Scots had sustained a severe defeat at Neville's Cross, near Durham, October 17, 1346, their King, David II., being taken prisoner. On September 19, 1356, the Black Prince obtained a brilliant victory at Poitiers, King John of France falling into his hands. The Scotch monarch was released for a ransom of £100,000 in 1357, and King John for a ransom of 3,000,000 crowns in 1360. On November 27, 1363, David, King of Scotland, entered into a secret agreement with Edward, in virtue of which his kingdom, if he died without male issue, was to pass to the English sovereign. Meanwhile the Black Prince, who had married Joan, daughter of the Earl of Kent, had received from his father Aquitaine and Gascony, and ruled there for some time prosperously. War with France broke out again in 1369; the English were unsuccessful, and in 1375 a truce was concluded on account of the exhaustion of both parties. Edward waged war no more. In spite of his brilliant victories, and in spite of the dazzling valor of his son, he failed to achieve lasting success. Neither in Scotland nor in France did he realize his ambitions. Affairs at home were no less unsatisfactory during the last years of his life. He quarreled with his Parliaments, and the Black Prince sided with the opposition. The aged King fell completely under the control of his mistress, Alice Perrers, and of a small coterie of unscrupulous courtiers, headed by the King's son, John of Gaunt, Duke of Lancaster. Edward died on June 21, 1377. By his wife, Philippa, he had seven sons and five daughters, seven of whom died young. Edward was fond of all knightly amusements, and throughout his reign acted the part of a knight rather than that of a king. He was hard-hearted and selfish, and never won the love of his people. He died deserted by all. His private life was immoral, and his public actions governed only by his own interests. Among the laws of Edward's reign were several which attacked Papal claims to religious taxes. Consult: Longman, *Life and Times of Edward III.* (London, 1869); Stubbs, *Constitutional History of England*, vol. ii. (Oxford, 1874); Green, *History of the English People*, vol. i. (London, and New York, 1878); Mackinnon, *History of Edward III.* (London, 1900). See HUNDRED YEARS' WAR; SCOTLAND.

EDWARD IV. (c.1442-83). King of England from 1461 to 1483. He was the son of Richard, Duke of York, and was born at Rouen in 1441 or 1442. His original title was that of Earl of March. After the death of his father, in the battle of Wakefield, December 31, 1460, Edward became the head of the Yorkist party, and as such speedily reëstablished the fortunes of his house. After routing the Royal or Lancastrian forces, under the earls of Pembroke and Ormond, at Mortimer's Cross, near Hereford, February 2, 1461, Edward marched toward London, which he entered on February 26th. He immediately laid his claim to the crown before Parliament, which admitted its validity, and on March 14th he ascended the throne as Edward IV., amid the acclamations of the citizens of London, with whom he was a great favorite. His first victory as King over the Lancastrians was obtained at Towton, in Yorkshire, on March 29, 1461. This was followed by minor successes, till finally, in May, 1464, by the victories of Lord Montague, the Lancastrians were completely crushed. On May 1, 1464, Edward married Elizabeth Woodville, widow of Sir John Grey. This marriage gave great offense to the Earl of Warwick, by far the most powerful of Edward's adherents, who was at that time engaged in negotiating a marriage between Edward and the sister-in-law of Louis XI. of France. The favors showered upon the Queen's relatives caused great discontent. In 1469 Warwick openly declared against Edward, joined Queen Margaret, the wife of the helpless Henry VI. and the intrepid leader of the Lancastrians, and finally compelled Edward to flee the country. Henry VI. was released from the Tower, where he had been a prisoner for six years, and was once more invested with the royal authority. But in the spring of 1471 Edward landed at the Humber, proceeded to London, seized the person of Henry, and was again hailed King by the inhabitants. Warwick now gathered an army and hurried to encounter him. The two met at Barnet, where Warwick was defeated and slain, April 14, 1471. On May 4th Edward routed the Lancastrians at Tewkesbury, capturing Queen Margaret. Her son, Prince Edward, was either slain in battle or murdered the day after the fight. Henry VI. died May 21, 1471, not without suspicion of murder. Though the later years of Edward's reign were peaceful and marked by few political incidents of any moment, the period was one of great importance in the development of the English Constitution. Easy-going as he was, and fond of pleasure, the King steadily pursued his aim of aggrandizing the crown at the expense of Parliament, and by a policy of silent but aggressive assertion he succeeded in laying the foundations for the absolute monarchy of the Tudors. Edward was brave and debonair, as his immense popularity shows, but he was dissolute in the extreme. It was during his reign that printing and silk manufactures were introduced into England. In law few notable changes occurred, but the practice of indirect pleading dates from this period, which is also illustrious for the names of distinguished legists, such as Littleton and Fortescue. Consult Green, *History of the English People* (London and New York, 1878). See Henry VI.; Roses, War of the; Warwick, Richard Neville, Earl of.

EDWARD V. (1470-83). King of England. The son of Edward IV., he was born in the Westminster Sanctuary, November 4, 1470. When his father died he was thirteen years old. He proceeded to London for his coronation, which had been appointed for May 14, 1483, but was removed from the care of his maternal relatives by his paternal uncle, Richard, Duke of Gloucester, who in the same month had himself proclaimed Protector of the Kingdom, and confined Edward and his younger brother, the Duke of York, in the Tower. The rumor of their death spread, when a movement originated for their liberation, but was discredited, popular opinion maintaining that they had been exiled. Twenty years later it transpired that Brackenbury, Constable of the Tower, refused to slay the princes at Richard's command, and Sir James Tyrrel, with two servants, gained admittance to their chamber while they were asleep, smothered them with pillows, and buried them at the foot of a staircase. The skeletons found at the foot of a staircase in the White Tower, in the reign of Charles II., and buried at his command in Westminster Abbey, are considered to have been those of the young princes.

EDWARD VI. (1537-53). King of England from 1547 to 1553. The son of Henry VIII. by his third wife, Jane Seymour. Edward was born at Hampton Court, October 12, 1537. He succeeded to the throne at his father's death, January 28, 1547, his uncle, Edward Seymour, Earl of Hertford, being chosen Protector and created Duke of Somerset. Edward received a careful education, and was a studious, religious, and precocious youth; but he was too young to exercise any personal influence on the important events of his reign. His religious convictions, however, were shared by the Protector, who favored the principles of the Reformation, and during his rule great strides were made toward the establishment of Protestantism in England. The images were removed from the churches; the laity were allowed the cup at the ceremony of the Lord's Supper; Henry's famous six articles (known as the Bloody Statute) were repealed; and a new service book, known as the First Prayer Book of Edward VI. (see Prayer Book, Common), was compiled by Cranmer and Ridley, assisted by eleven other divines, and ordered to be used. During the first year of the protectorate Seymour invaded Scotland, on account of the refusal of the Scottish Government to fulfill the contract into which it had entered with Henry VIII. that Mary Queen of Scots should marry Edward. At the battle of Pinkie, September 10, 1547, the Scots were completely beaten; but Seymour, before he could inflict other damage, was required at home, and returned to find that his brother, Lord Seymour, had been intriguing against him. Somerset had him arrested, tried, and condemned for treason, and on March 30, 1549, he was beheaded on Tower Hill. In the summer of the same year the Protector quelled an insurrection of the populace headed by one Kett, a tanner; but a more dangerous adversary appeared in John Dudley, Earl of Warwick, whose party, by insinuations against Somerset, excited the nation against him and compelled the King to sign his deposition. In October, 1551, Somerset was placed in the Tower; and on December 1st he was tried before the House of Lords for treason, condemned, and executed, January 22, 1552. Before Somerset's execution Dudley had been created Duke of

Northumberland. He was (judging from his dying declaration) a Catholic, but took no action to reëstablish the old religion. His great aim was to secure the succession to the throne of England for his family. With this view he married his son, Lord Guildford Dudley, to Lady Jane Grey, daughter of the Duchess of Suffolk, to whom Henry VIII. had willed the crown in default of issue by Edward, Mary, or Elizabeth. Northumberland worked upon the consumptive and dying Edward to exclude Mary and Elizabeth on the ground of illegitimacy, and to nominate Lady Jane Grey as his successor. Edward consented, and a document settling the succession on this lady was drawn up in June, 1553. The King lived only a few weeks after, dying on July 6. Edward's educational accomplishments were somewhat discounted by shrewdness and a hardness of character, which were exemplified by marked callousness when signing the death warrants of Seymour and Somerset. Edward VI. restored many of the grammar schools suppressed by Henry VIII. These schools are still known as King Edward's schools. Consult: Nichol, *Literary Remains of Edward VI.* (2 vols., London, 1857); Gasquet and Bishop, *Edward VI. and the Book of Common Prayer* (London, 1891); Hayward, *Life and Raigne of King Edward the Sixt* (London, 1630).

EDWARD VII. (1841—). King of the United Kingdom of Great Britain and Ireland, and of all the British Dominions beyond the Seas, Emperor of India. The second child and eldest son of Queen Victoria and the Prince Consort Albert (q.v.). He was born in Buckingham Palace, London, on November 9, 1841, and was christened Albert Edward. He succeeded his mother on January 22, 1901. At his birth he was created Prince of Wales, and by virtue of that dignity he became also Knight of the Garter. As heir apparent to the British throne he succeeded to the title of Duke of Cornwall and its emoluments. As heir to the crown of Scotland he became Great Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles. On September 10, 1849, he was created Earl of Dublin, a title conferred on him and his heirs in perpetuity. Additional titles and commands borne by him are: Duke of Saxony, colonel of the Tenth Hussars, colonel-in-chief of the Rifle Brigade, field-marshal of the British Army (1875), also of the German Army (1883). He received an elaborate and carefully planned education under four private tutors, and subsequently under Baron Stockmar and Charles Kingsley. He spent a session at Edinburgh University, a year at Oxford, and four terms at Cambridge. In 1860 he traveled through Canada and the United States. In June, 1861, he joined the army at the Curragh Camp, Ireland. The next year he made a tour of the Orient, accompanied by Dean Stanley of Westminster, and visited Jerusalem and other places of biblical interest.

In February, 1863, his public life was formally begun, when, as heir to the throne, he took his seat in the House of Lords, and on March 10th of the same year he married Princess Alexandra Caroline Mary Charlotte Louisa Julia, eldest daughter of King Christian IX. of Denmark, born December 1, 1844. They have had six children: (1) Prince Albert Victor Christian Edward, Duke of Clarence and Avondale, born January 8, 1864; died January 14, 1892. (2) Prince George Frederick Ernest Albert, Prince of Wales, formerly Duke of York, the present heir apparent, born June 3, 1865; married Princess May of Teck, July 6, 1893. (3) Princess Louisa Victoria Alexandra Dagmar, born February 20, 1867; married, July 27, 1889, to the Earl, afterwards Duke, of Fife. (4) Princess Victoria Alexandra Olga Mary, born July 6, 1868. (5) Princess Maude Charlotte Mary Victoria, born November 26, 1869; married, July 22, 1896, to Prince Charles of Denmark. (6) Prince Alexander John Charles Albert, born April 6, 1871, who died the next day.

Typhoid fever seriously threatened the Prince's life in 1872, and his recovery was celebrated with a thanksgiving and enthusiasm throughout the Kingdom and Empire that testified to his wide popularity. In 1874 he was elected and installed with elaborate ceremony as Grand-Master of the Freemasons. He made an extended tour through the Indian Empire in 1875-76, and was received everywhere with lavish and magnificent hospitality and every expression of loyalty. During the long years of his princehood his public duties consisted solely in the arduous office of representation, a toil and tax of a nature not sufficiently appreciated because not understood. A liberal patron of art and science, he manifested a lively interest in exhibitions, charitable institutions, the housing of the poor, agriculture, etc. He assisted in promoting the Royal College of Music, and the Imperial Institute is due to his suggestion. He carefully abstained from participation in politics, and from all action which could be construed into preference of one party over another. He cultivated the most friendly relations with public men, whatever their opinions might be, and he was equally courteous to all. At peculiar crises of public opinion, his visits to Mr. Gladstone, Mr. Bright, and other prominent members of the Liberal Party did much to counterbalance in the public mind the Queen's preference for her Conservative ministers.

All preparations for the coronation had been made for June 26, 1902, when disquieting rumors of the King's ill health, which had been current for several days previously, were confirmed by the postponement of the ceremonies and the announcement of perityphlitis as the cause of his illness. He underwent an operation on the 24th of June and after some weeks of anxiety recovered. The adjourned coronation took place on August 9, 1902. With the exception of William IV., he is the oldest monarch who has ascended the throne of England since Egbert. Consult: *The Private Life of King Edward VII.* (New York, 1901); *Life of the King*, by "One of His Majesty's Servants" (London, 1901); Hopkins, *Life of King Edward VII.* (Philadelphia, 1902).

EDWARD, THE BLACK PRINCE (so named from the color of his armor) (1330-76). The eldest son of Edward III. of England. He was created Duke of Cornwall in his seventh year, and a year later, during the absence of his father, who was embarking on his war against France, was appointed nominal guardian of the kingdom. He held this office again in 1340 and 1342, and was created Prince of Wales in 1343. Three years later he accompanied his father to France, and in the battle of Crécy (q.v.) led the most gallant division of the army.

He also shared his father's glory in the victories which followed. In 1355 he was given command of the chief army in the French War, landed at Bordeaux, and after several smaller successes, gained, in 1356, the victory of Poitiers (q.v.), capturing the French King, John II., whom he carried captive to London, in 1357. In 1361, during the short peace following King John's ransom, Edward married his cousin Joanna, the 'fair maid of Kent,' whose third husband he was, and being created Prince of Aquitaine and Gascony in 1362, crossed over to his new possession, which he ruled successfully and peacefully for a time. Entering into an entangling alliance with Peter the Cruel, the deposed King of Castile, he found himself burdened with the expenses and losses of a profitless war, and for the excessive taxes laid upon his duchy was summoned to account by the French King as his liege lord. To this summons Edward replied haughtily, "We will come, with our helmet on our head and 60,000 men in our company." This led to a rupture between France and England. The French planned a double invasion of the English territory in France. The Duke of Anjou, commanding one expedition, besieged Limoges, which had been ceded to the English by the Treaty of Bretigny and formed part of the Principality of Aquitaine. The city was surrendered by the treachery of its bishop. The Black Prince, enraged by this act, after a siege of a month, recaptured the city by assault (1370), and is said to have put to the sword 3000 of its inhabitants. This outburst of cruelty is the chief blot on the fame of the Prince, and it is only partially explained by his disordered health, which itself was perhaps due to the irritation of seeing the English power waning in France, in spite of all his victories. He was compelled by the advice of his physicians to return in 1371 to England, where he lingered in continually failing health for five years. In these years he saw the loss of Aquitaine, but he did good service to the country in opposing the corrupt and oppressive influences which surrounded the doting Edward III., and by his help Parliament was able to pass acts in restraint of the dangerous ambition of John, Duke of Lancaster. He died, probably in June, 1376, and was buried in the Cathedral of Canterbury, where part of his armor still hangs above his tomb. His second son occupied the throne in the following years as Richard II. Consult: Longman, *Life and Times of Edward III.* (London, 1869); Mackinnon, *History of Edward III.* (London, 1900).

EDWARD II. A tragedy by Christopher Marlowe (about 1590), published 1598. It deals with the moral and political ruin of the title character, through love of the favorite Gaveston and through the rebellion of the indignant barons.

EDWARD, THOMAS (1814-86). A Scottish zoölogist and collector, known as 'the Banff naturalist.' He was born at Gosport, Hampshire, and at eleven years of age he was apprenticed in Aberdeen to a shoemaker, whose trade he followed throughout his life, mainly near Banff. Before he was five years old he showed an almost passionate fondness for all sorts of bird and animals, and by 1845 he had collected some 2000 species of animals, which he was compelled to sell for about £20. He then set courageously at work to make another collection, at the same time recording his observations, which his friend, the Rev. James Smith, sent to the *Zoölogist*, where the publication of his detailed and minute descriptions of the habits of birds and beasts attracted attention from the similarity of his methods and of his accounts to those of Audubon. He later turned his attention enthusiastically to marine zoölogy, and discovered twenty new species of crustacea in the Moray Firth. In 1866 came the first recognition of the scientific value of his researches, in an election as an associate of the Linnæan Society of London. In 1876, through the influence of Charles Darwin and others, he received an annual civil list pension of £50. Consult Smiles, *Life of Thomas Edward* (London, 1876).

ED'WARDES, Sir HERBERT BENJAMIN (1819-68). A British East Indian soldier and administrator. He was born in Shropshire, was educated at King's College, London, and entered the Indian Army as a cadet in the First Bengal Fusiliers in 1840. He won promotion rapidly, and served on the staff of Sir Hugh Gough, the British commander-in-chief in the first Sikh War, in 1845-46. In 1847 he was made first assistant to Sir Henry Lawrence, the British resident at Lahore. In the summer of 1848 he suppressed an uprising in Mooltan, and for his services received the thanks of both Houses of Parliament and was brevetted major. He wrote an account of the campaign, entitled *A Year on the Punjab Frontier in 1848-49.* During the Indian Mutiny in 1857 Edwardes rendered invaluable services by securing the neutrality of Afghanistan, thus enabling the troops to be withdrawn from the northwest border and used effectively in the relief of Delhi and Lucknow. He was offered the Governorship of the Punjab in 1862, but refused it on account of failing health, which compelled his return to England. He died shortly after being promoted to the rank of major-general. The town of Banu in the Punjab was renamed, in his honor, Edwardesabad.

ED'WARDS, AMELIA BLANDFORD (1831-92). An English novelist and Egyptologist. She was born in London, and first became known by her contributions to English periodicals. She attracted attention as a novelist by *My Brother's Wife* (1855); *Hand and Glove* (1859); *In the Days of My Youth* (1872); *Lord Brackenbury* (1880); and other stories of considerable merit. A book entitled *A Thousand Miles Up the Nile* (1877) is illustrated by her own sketches, and gives an account of one of her exploring expeditions in Egypt. Also noteworthy is *Pharaohs, Fellahs, and Explorers* (1891). The last ten years of her life were strictly devoted to the study of Egyptology, on which subject she contributed articles to the ninth edition of the *Encyclopædia Britannica* and to the American supplement to that work, and definitions to the *Standard Dictionary*, besides lecturing with great success both in England and America.

EDWARDS, BELA BATES (1802-52). An American clergyman and author, born at Southampton (Hampshire County), Mass. He graduated at Amherst College in 1824 and at Andover Theological Seminary in 1830. In 1837 he was elected professor of Hebrew, and in 1848 associate professor of sacred literature, at Andover. At various times he was the editor of periodicals, including the *American Quarterly Register* from 1828 to 1842, and the *Bibliotheca Sacra* from 1844 until his death. He was also a founder of the Society for Ameliorating the Condition of the Slave and of the American Missionary Association. As a scholar and educator he was very highly ranked. His published works include: *The Missionary Gazetteer* (1832); *The Biography of Self-Taught Men, with an Introductory Essay* (1832); a *Memoir of Reverend Elias Cornelius* (1833); *Classical Studies: Essays on Ancient Literature and Art, with the Biography and Correspondence of Eminent Philologists* (1843), with B. Sears and C. C. Felton, and a translation (with S. H. Taylor; 7th ed. 1860) of Raphael Kühner's *Schulgrammatik der griechischen Sprache* (Hanover, 1836). Two volumes of his addresses and sermons were published, with a memoir by Park (Boston, 1853).

EDWARDS, Bryan (1743-1800). A West Indian merchant and author. He was born at Westbury, Wiltshire, and went to Jamaica in 1759, where he soon became a prosperous merchant. As a member of the Colonial Assembly he advocated closer commercial relations with the United States. In 1792 he returned to England, established a bank at Southampton, and was elected to the House of Commons. His principal literary production is the *History of the British Colonies in the West Indies* (5th ed. 1819, translated into German and partly also into Spanish). He also wrote a *History of Saint Domingo* (1807; translated into French).

EDWARDS, George Wharton (1859—). An American painter and illustrator, born at Fairhaven, Conn. He studied in Antwerp and Paris, and after his return to America exhibited frequently. He is the author of *Thumbnail Sketches* (1886), *P'tit Matinic Monotones* (1887), *The Rivalries of Long and Short Codiao* (1888), and *Break o' Day* (1889). His work as an illustrator for the best magazines in America is well known, and his water-colors show daintiness and delicacy of finish.

EDWARDS, Harry Stillwell (1855—). An American journalist, novelist, and poet, born at Macon, Ga. He was a graduate in law of Mercer University, Macon (1877); served as assistant editor and editor of Macon journals (1881-88), gaining distinction as a writer of dialect stories. Noteworthy among his volumes are *Two Runaways and Other Stories* (1889); *The Marbcan Cousins;* and *Sons and Fathers,* a story that won a prize of $10,000 in the Chicago *Record.* Mr. Edwards is strongest in studies of plantation life, as well among the Georgian aristocracy as among the negro laborers.

EDWARDS, Henry Sutherland (1828-1906). An English journalist and author, born in London, and educated in that city and in France. He was correspondent of the London *Times* at the coronation of Alexander II. of Russia (1856); in the camp of the insurgents at Warsaw (1862-63); at Luxembourg (1867); and at German army headquarters during the Franco-Prussian War. His publications include: *The Russians at Home and the Russians Abroad* (2d ed. 1879); *Private History of a Polish Insurrection* (1864); *The Germans in France* (1874); *The Prima Donna: Her History and Surroundings from the Seventeenth to the Nineteenth Century* (2 vols., 1888); *Malvina,* a novel (3 vols., 1871); *Dutiful Daughters: A Tale of London Life,* a novel (1890); *Personal Recollections* (1900); *Sir William White: His Life and Correspondence* (1902).

EDWARDS, Jonathan (the elder) (1703-58). The most celebrated early American divine and metaphysician. He was born at East Windsor, Conn., October 5, 1703. He was a precocious child, and at thirteen was ready for college, and entered Yale. Here his mind turned most readily to the profounder studies, and when he graduated, in 1720, he had already arrived at those great leading principles which formed the staple of his later thinking and constitute his chief contribution to the thought of his age. He was deeply read in Locke, and probably in Leibnitz, Malebranche, Cumberland, and Hutcheson, possibly also in Berkeley. After graduation he was for a time tutor in his college. In 1727 he was ordained and installed colleague with his grandfather, Rev. Solomon Stoddard, in Northampton, Mass., where he continued till dismissed in 1750. In 1734 he preached a course of sermons upon justification by faith, in which he advocated Calvinistic views in a community that had fallen largely under the influence of Arminianism. The result was a revival in his parish, the prelude to the 'Great Awakening' of 1740 and the following years, in which Edwards was a leader. The town of Northampton was transformed, but in the country at large the value and genuineness of the revival was much questioned, and Edwards was therefore led into an elaborate defense of it in his treatise *Faithful Narrative, etc.* (1736). Other works of this period are directly or indirectly connected with the revival: *Distinguishing Marks of a Work of the Spirit of God* (1741); *Thoughts on the Revival of Religion* (1742); and *The Religious Affections* (1746), his chief work in experimental religion. He had now become a power throughout New England and had acquired a well-founded fame even in England.

But the regular progress of his life was to be rudely interrupted. It had been the custom under his predecessor to admit persons not of scandalous life, but not professing conversion, to the Lord's Table as a means of grace. Edwards became convinced by the experiences of the revival that this practice, so contrary to the original theory and practice of New England, was mischievous, and that no one ought to be admitted to membership in the church or to the communion who was not by personal profession and in 'the judgment of a rational charity' a true believer in Jesus Christ. As this position involved an application of an ecclesiastical discipline to which the parish had long been unaccustomed, and as it affected personally individuals of great prominence and influence in the town, the position which Edwards took aroused the most violent opposition. He was not even allowed to explain his position in the pulpit, and was obliged to print his defense (*Qualifications for Full Communion*), which was read by few. In 1750 he was dismissed by council. His prospects were thus apparently ruined; but in fact the period of his greatest activity, in which he laid the foundation of his enduring fame, was thus ushered in. He obtained an appointment as missionary to the Indians at Stockbridge, which he held for the following eight years. In the quiet of this secluded spot he wrote his *Freedom of the Will;* his *Nature of Virtue;* and his *Original Sin.* Here he wrought a work for the Indians, the traces of which are discernible to this day. And here he continued his acquaintance with the first and principal in the line of his successors, and of the members of his 'school,' Samuel Hopkins. In 1758 he reluctantly accepted the presidency of Princeton College, but after a few weeks of service was removed by death, March 22, 1758.

Edwards's great fame rests upon his work as a theologian in the defense and the development of the evangelical system. He was originally, and remained, a strong Calvinist. His earliest discussion, that on Justification, was marked by a certain conventionality of treatment, indicating the controlling influence of theological tradition. But there is even here the breathing of a new spirit, as when faith is defined in a way unknown in the previous century, and identified with repentance as constituting with that the indivisible act of conversion. The treatise upon the *Freedom of the Will* is an unwavering defense of determinism, and contends not only that this is the teaching of Scripture and reason, but that any other view is false, absurd, and inconceivable, even by those who propound it. The doctrine which he thus maintains is only the position of Locke, from whose earlier editions all the positions and all the arguments, including even the famous *Reductio ad Absurdum* of the infinite series, are all drawn. But the fineness, the dialectical skill, the detail with which every conceivable objection is brought forward and demolished, and the tremendousness of the general effect, are all Edwards's own. While too much praise has often been lavished upon the book as a contribution to the permanent advancement of the theme, too much cannot well be said of its perfection of form, or of the influence which it immediately obtained and has continued to hold. It is probably the most famous book in theology that America has yet produced, and one of the most famous philosophical works of the world. But there was much that was new in Edwards and which was destined to begin a distinct theological movement in America. In the treatise upon *Original Sin* suggestions looking to a new emphasis upon the voluntary character and personal nature of sin were made, which, in combination with suggestions in the *Freedom of the Will* upon the natural power of man, led ultimately to a new anthropology, in which the doctrines of original sin, imputation, ability, and regeneration were to undergo much modification. (See NEW ENGLAND THEOLOGY.) More directly influential was the treatise upon the *Nature of Virtue.* This propounded the doctrine that the essence of virtue is love, or the choice of the good of being according to its worth. Thus for the first time in America an intelligible answer was given to the question, What is holiness? and the moral attributes of God were viewed as comprised in love. The treatise was a posthumous one, but its leading ideas were at once adopted by Hopkins, became the underlying idea of the theory of the Atonement adopted by Edwards's son, and have become the characteristic principles of the school of thought called 'New England,' or often 'Edwardean,' from Edwards himself. Other suggestions are to be found scattered up and down the pages of Edwards, many of which have greatly influenced his followers. But most of all, perhaps, should be noted his utter loyalty to truth and his fearlessness in investigation.

Edwards was preëminently a religious man. As a child he was profoundly impressed with the thought of God. He displayed modesty, humility, and serenity of spirit. Although engaging constantly in theological controversy, he is impersonal, calm, just, fair, and candid in his method of conducting the discussion. He was a student from his childhood, and extended his studies over pretty much the entire range of learning in his day. As a preacher he was one of the first of his age. His ability to hold the attention of his audiences to long and careful trains of thought till he had convinced and won them, would of itself illustrate this statement. But the well-known instances of his great power over congregations, as in the sermon at Enfield, where the people rose in their seats and wept and sobbed as he described the state of the lost, till he was obliged himself to ask them to be still, prove his ability to stir the feelings profoundly, and that he felt profoundly himself.

Editions of his works are the Worcester (1809), originally in eight volumes, now reprinted in four volumes; and (the best) the Dwight edition in ten volumes (New York, 1829-30), with memoir. Consult Allen, *Jonathan Edwards* (Boston, 1889).

EDWARDS, JONATHAN (the younger) (1745-1801). An American theologian, born at Northampton, Mass., the second son of Jonathan Edwards the Elder. Early left an orphan, his education was provided for by friends, and he was graduated at Princeton in 1765. While in college he was converted, and after graduation studied theology with the friend of his father, Joseph Bellamy, of Bethlehem, Conn. He was tutor in Princeton, 1767-69; pastor in White Haven, Conn., 1769-95; in Colebrook, Conn., 1795-99; whence he went to the presidency of Union College, Schenectady. As a theologian his fame rests upon his reply to Chauncy upon the salvation of all men, in which he defended the usual evangelical doctrine; his reply to Samuel West's *Essays on Liberty and Necessity,* in which he largely modified his father's theory of the will by giving it a liberal interpretation scarcely reconcilable with its plain meaning; and by his sermons upon the Atonement. He took part, in the last work, in the Universalist controversy then raging in New England. The Universalists of the Murray school had argued upon the basis of the standard Calvinistic theory of the Atonement, that Christ had satisfied justice in behalf of all those for whom He died, and paid their debt before God. But He had died for all men; therefore all men are saved. Edwards rejected the conclusion as against the Bible. But he could not deny the minor premise; and he therefore was led to modify the major premise and teach that Christ did not satisfy justice for men so that their debt to God was paid, but was a penal example, rendering it, not obligatory upon God to forgive all men, but, consistent with all the interests involved (which, according to the new theory of virtue, he must maintain), to forgive repentant sinners. The main idea was borrowed from Grotius, but the ideal basis of the Atonement in the love of God was a new feature. Edwards thus founded the 'New England' or 'governmental' theory of the Atonement, which maintained its place as the generally accepted theory among Congregationalists and 'New School' Presbyterians for well nigh a century. His works were published at Andover (1842), in two volumes, with a memoir by Tryon Edwards.

EDWARDS, Matilda Betham. See Betham-Edwards, Matilda.

EDWARDS, Pierrepont (1750-1826). An American lawyer, son of Jonathan Edwards, the theologian. He graduated at Princeton in 1768, was admitted to the bar, began practice at New Haven, Conn., in 1771, and served in the Revolutionary Army. In 1787-88 he was a member of the Continental Congress, and later became United States District Judge for Connecticut. He founded the Toleration Party in Connecticut, and his energy in this cause made him hated by the colonists. After the treason of Benedict Arnold, he became administrator of that officer's estate.

EDWARDS, William (1770-1851). An American inventor, the grandson of Jonathan Edwards, the theologian. He was born in Elizabethtown, N. J. He introduced a valuable improvement in the manufacture of leather, whereby tanning was accomplished in a quarter of the usual time. This and other improvements and machines introduced by him, including a rolling-machine, greatly advanced the production of leather in America.

ED'WARDSVILLE. A city and county-seat of Madison County, Ill., 23 miles northeast of Saint Louis, Mo., on the Wabash, the Illinois Terminal, the Toledo, Saint Louis and Western, and other railroads (Map: Illinois, B 5). It is in an agricultural and coal-mining district, and has extensive manufactures of tools, plumbing supplies, brass finishings, singletrees, buggies, etc. The city has a public library. Settled in 1812, Edwardsville was incorporated in 1819, and at present is governed under a charter of 1872, which provides for a mayor, elected every two years, and a city council. Population, in 1890, 3561; in 1901, 4157.

ED'WIN, or **EADWINE** (c.585-633). A king of Northumbria. He was the son of Ælla, King of Deira, and was only three years old on the death of his father, in 588. Deira was invaded by Ethelric, the King of Bernicia, and the infant Edwin was carried by his guardians into North Wales, where he was brought up. Later he lived as an exile under the protection of Cearl, King of Mercia, and Rædwald, the ruler of East Anglia. The latter in 617 raised an army, defeated and slew Ethelfrith, who had succeeded his father, Ethelric, and restored Edwin to his father's throne. Soon after his return to Deira, Edwin succeeded in reducing Bernicia, and established the Kingdom of Northumbria. He speedily extended his power over a large part of England, his authority stretching as far west as the islands of Anglesea and Man, and as far north as the town of Edinburgh, which he is believed to have fortified, and which still bears his name. Especially after 626, when he defeated the West Saxon King, Edwin was suzerain practically of all England save the Kingdom of Kent, with whose ruler he was in alliance, having married the King's sister, Ethelburh, in 625. Ethelburh was a Christian, and owing to her influence and the exhortations of the missionary priest Paulinus, Edwin with his entire witan was brought over to Christianity in 627. He had previously been acknowledged as Bretwalda, or leader of the English, and his power increased greatly after his conversion. In 633 Penda of Mercia, the most powerful prince in England after Edwin, and the champion of the old heathen religion, united with the Welsh against the Northumbrian King, and on October 12, 633, inflicted an overwhelming defeat upon him at Heathfield. Edwin himself was killed, the Kingdom of Northumbria fell apart, and Christianity for a time was extinguished in northern England. Consult Green, *The Making of England* (London and New York, 1881).

EDWIN AND AN'GELI'NA. A poem by Oliver Goldsmith, printed privately for the amusement of the Countess of Northumberland late in 1765, and afterwards published in the *Vicar of Wakefield*. The author has been unjustly accused of stealing it from Percy's *Friar of Orders Grey*, and also of translating it bodily from the French.

EDWIN DROOD. See Mystery of Edwin Drood.

ED'WY, or **EADWIG** (?-959). A king of the English. He was the eldest son of Eadmund I. and succeeded his uncle Eadred in 955. Dunstan (q.v.) bitterly opposed his marrying Ælfgifu, "because they were too near akin," and was banished from the kingdom for his pains; but not long afterwards he was recalled by the Mercians, who had revolted from Edwy and proclaimed his brother Eadgar King. Edwy was forced to share the kingdom with his brother. He died October 1, 959.

EECKHOUT, āk'hout, Gerbrand van den (1621-74). A Dutch painter. He was born in Amsterdam and studied with Rembrandt, whose composition and coloring he imitated. In portrait-painting Eeckhout had a superior talent for expressing character. Among his best paintings on historical subjects are: "The Adoration of the Magi" (Museum of The Hague), and "The Raising of Jairus's Daughter" (Berlin Museum).

EECLOO, ā-klō'. A town of Belgium, in the Province of East Flanders, 11 miles northwest of Ghent (Map: Belgium, B 3). It has manufactures of lace, cotton, and woolen fabrics. Population, in 1900, 12,897.

EEDEN, ā'den, Frederik van (1860—). A Dutch author. He was born in Haarlem, studied at the University of Amsterdam, and became a practicing physician at Bussun. His *De kleine Johannes* (1887), a story of animal life, attracted great attention. Others of his works are the important poems, *Johannes Viator* (1892), *Ellen* (1891), *De passieloose Lelie* (1901), *Enkele Verzen* (1898). Several of his dramas have also been successfully presented.

EEKHOUD, āk'hout, Georges (1854—). A Belgian novelist and poet, born in Antwerp. His early poems, *Myrtes et cyprès* (1876), *Zigzags poétiques* (1877), and *Les pittoresques* (1879), were romantic. His short stories (*Kermesses*, 1884) showed a trend to realism, accentuated in his first novel, *Les milices de Saint-François* (1886), where the naïve mysticism of Flemish peasant life is finely suggested. *La nouvelle Carthage* (1888), his masterpiece, is a realistic picture of life in Antwerp. Noteworthy also are *Les fusillés de Malines* (1890), a story of the peasant revolt against the French in 1798, *La faneuse d'amour* (1900), and *L'autre vue* (1905).

EEL (AS. *æl*, Ger. *Aal*). An elongated, serpent-shaped fish of the order Apodes (q.v.); soft-rayed, without ventral fins, and having the long dorsal fin confluent with the anal around the tip of the tail. The skin is smooth and exceedingly slimy and slippery. It may contain small scales, or scales may be entirely wanting. The vertebræ, because of the elongated form of the body, are very numerous. The best-known eels are the fresh-water eel (*Anguilla anguilla*), belonging to the family Anguillidæ, and the scaleless conger eel (*Leptocephalus conger*), of the family Leptocephalidæ. The common fresh-water eels, which have minute scales imbedded in the skin, occur on both sides of the Atlantic and ascend rivers and live there for the most part, returning to the sea in the autumn, or they may bury themselves in the mud during the winter. Sometimes they are dug out of the mud of river banks where large numbers of them may be found congregated together. Their activities and migrations seem to take place mostly during the night. They frequently make excursions on land in the moist grass for considerable distances, the purpose of which is not well understood.

The reproduction of the eel has excited the attention of naturalists since the days of Aristotle. In 1763 an eel-like fish, taken off the English coast by William Morris, was named Leptocephalus. Numerous specimens have since been obtained all over the world and the family Leptocephalidæ has been erected to contain the various species which have been described. It has been suggested that the Leptocephalidæ are larvæ of eels, and this has been shown by Delage and by Grassi and Calandruccio, as a result of breeding experiments, to be the case, for as they developed they revealed all the characters of conger eels. Eventually Grassi showed that one of these Leptocephali (*Leptocephalus brevirostris*), characterized by its small size, short body, and absence of pigment, is the young or larval stage of the common eel. The discovery of Grassi (1893) was facilitated by the peculiar whirlpool currents in the Straits of Messina which occasionally bring bottom organisms to the surface, and since the young eels are found at the surface with well-known denizens of the deep sea, it is concluded that the young develop at great depths (1500 feet). From the depths are brought also adult male and female eels with ripe eggs and sperm. The entire reproductive history of the eel may now be given as follows: Eels that descend from the fresh water to the sea do so during the months October to January, and in a sexually immature condition, as has long been known. They go to the depths and live there for eight months or more, during which time they become sexually mature. The eggs are fertilized in August and the following months, and being heavy they tend to keep to the bottom, where, on account of the low temperature, they develop slowly. Larvæ from these eggs are found in spring and summer. In the autumn and winter, October to February, these young eels pass from the sea into fresh water in great numbers—immigrations which have long been known as 'eelfares'; the fish themselves, now over a year old, are called 'elvers.' Two years then intervene between the descent of the parent eels and the ascent of their progeny. The old fish seem to return to the fresh water irregularly at various months of the year.

Eels are very voracious and will eat the most varied sort of food. They grow to a length of four to five feet. Although much prejudice against them exists in certain regions, they are important food-fishes, and are much eaten both in Europe and America. By many they are thought to be poisonous, a notion which may have its origin in the well-known fact that eel's blood transfused into the system of higher vertebrates is very poisonous; but the same is true of the blood of other animals, though, perhaps to a smaller degree. Anguilla, of which there are several species, is found in all warm seas except the East Pacific. Eels are trapped by eel-pots and baskets and are extensively speared. See CONGER; ELECTRIC FISHES; and Plate of EELS, CONGERS, AND MORAYS.

EE'LEE. See ILL.

EEL-GRASS. See TAPE-GRASS.

EELLS, MYRON (1843—). An American Congregational clergyman, born at Walker's Prairie, Wash. He graduated at Pacific University, Ore., in 1866, and at Hartford Theological Seminary in 1871. After holding a pastorate at Boise City, Idaho, for two years (1872-74) he became a missionary among the Indians at Skokomish, Wash., and later pastor of the Congregational Church (1876). In 1893 he was appointed superintendent of the ethnological exhibit of Washington at the World's Columbian Exposition. His publications include: *History of Congregational Association of Washington and Oregon* (1881); *History of Indian Missions on the Pacific Coast* (1882); *Ten Years at Skokomish* (1886); *Father Eells* (1894); *Reply to Prof. Bourne's "The Whitman Legend"* (1902); and monographs on the Twana, Chemakum, and Clallum Indians of Washington, on the Indians of Puget Sound, and on hymns in the Chinook language. He prepared for the Smithsonian Institute many Indian vocabularies.

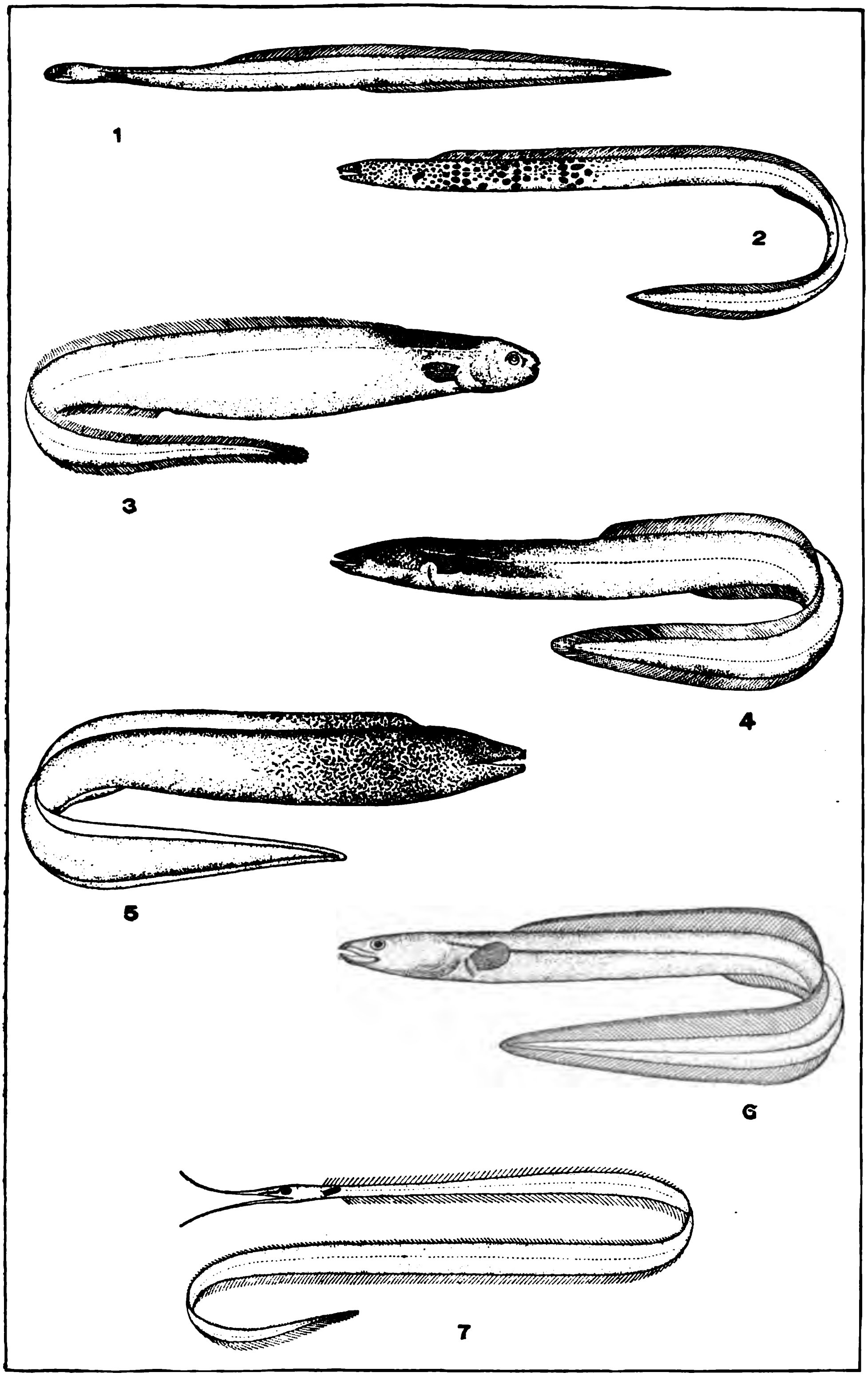
EELPOUT (AS. *ælepūte*, from *æl*, eel + *pūte*, pout). (1) In England, and locally in the Northern United States, the burbot (q.v.). (2) The mutton-fish (q.v.). (3) A catfish (Malapterurus). See CATFISH.

EELWORM. Any of the threadlike nematode worms of the family Anguillulidæ, as the vinegar-eel. Certain species in the East Indies cause a serious disease of sugar-cane called 'sereh,' and American species are injurious to cotton, the orange, peach, and other plants, by producing galls and 'root-knot.' Consult Neal, *United States Department of Agriculture, Bulletin 20* (Washington, 1889).

EFFECT (OF. *effect*, Lat. *effectus*, from *efficere*, to accomplish, from *ex*, out + *facere*, to do). The impression which the mind receives at the sight of a work of art without taking cognizance of the details that contribute to it. In sculpture it is the movement and general shape of the mass, which first impresses and produces the effect. In painting, effect is produced by the force of color, the balance of light and shade, and by composition. Bold sketches of their works are sometimes made by artists beforehand, for the purpose of adjusting the composition and coloring so as to produce the desired effect.

EFFEN'DI (Turk. *efendi*, gentleman.) A term of respect among the Turks, corresponding to our Mr. or Sir, or the French *monsieur*. The title is frequently added to the name of an office,

EELS, CONGERS, AND MORAYS



1. A PELAGIC EEL (Derichthys serpentinus).
2. A PELAGIC EEL (Quassiremus evionthas).
3. DEEP-SEA PARASITIC EEL (Simenchelys parasiticus).
4. COMMON EEL (Anguilla chrysypa).
5. SPOTTED MORAY (Lycodontis moringa).
6. CONGER EEL (Leptocephalus conger).
7. SNIPE EEL (Labichthys carinatus).

and always follows the name with which it is used.

EF'FINGHAM. A city and the county-seat of Effingham County, Ill., 101 miles east by north of Saint Louis, Mo., on the Vandalia Line, the Wabash, and the Illinois Central railroads (Map: Illinois, D 4). There are situated here colleges of photography and of photo-engraving. The chief industries are a milk-condensing and canning factory. Settled about 1850, Effingham was incorporated as a city in 1869. Population, in 1890, 3260; in 1900, 3774.

EFFLORESCENCE (from Lat. *efflorescere*, to blossom, from *ex*, out + *florescere*, inchoative of *florere*, to bloom, from *flos*, flower). A phenomenon exhibited by many crystalline compounds when exposed to the air; the compounds lose their water of crystallization and change into pulverulent masses. The white incrustation that frequently shows itself on the walls of buildings is an example of efflorescence.

EFFORT (OF. *effort*, *esfort*, Fr. *effort*, It. *sforzo*, from ML. *effortiare*, to strengthen, from Lat. *ex*, out + *fortis*, strong). In psychology, a term applied to conscious exertion, whether it arises from severe exercise of a muscle, as the effort involved in lifting a heavy weight, or from the conscious 'strain' which is present in ratiocinative thinking, as in solving a mathematical problem. The latter kind of effort is sometimes called 'mental effort' or 'mental work'; although the tendinous sensations accompanying severe muscular exertion are no less mental, and, as conscious experiences, are the same in kind as the effort realized in 'hard thinking' or in an attempt to remember, or in the struggle to decide on a course of conduct. The existence of effort has been used as an argument in favor of a peculiar activity of consciousness, as indicating that 'mental force' is expended in voluntary action; but it may also be looked upon as simply a complex of intensive organic sensations strongly toned with unpleasantness. In this case the 'work' is performed by the physiological processes accompanying effort. The prominent affective side of the experience is indicated in the common phrase 'feeling of effort.' Effort was for a long time held to be an essential part of the innervation sensation (q.v.); i.e. the sensation which was said to accompany the outflow of energy from the brain to the motor nerves. But this position has now been abandoned by most psychologists. See Attention; Conation.

EFFUSION (Lat. *effusio*, from *effundere*, to pour out, from *ex*, out + *fundere*, to pour). A term applied to the free outflowing of a gas through a pinhole, the resistance to the outflow being very small. The velocity of effusion is in the case of all kinds of gases found to be *inversely proportional to square roots of their densities*, and this holds good under all possible circumstances. An increase of the pressure exercised upon the gas has no effect on its rate of effusion. This appears somewhat strange on first thought; for it would seem that more gas should be expelled from a vessel by increased pressure. It is clear, however, that this must necessarily be the case, if we remember that when the pressure of a gas increases, its density increases at precisely the same rate; an increase of density causes a diminution of the rate of effusion, and thus the effect of a greater expelling force is exactly counterbalanced; so that the amount of gas actually flowing out through the hole remains unchanged.

Quite different from effusion is the phenomenon of *transpiration of gases*, i.e. the outflow of gases through long capillary tubes offering considerable resistance to their passage. The rate of transpiration of a gas depends on four factors: (1) the nature of the gas; (2) the density of the gas; (3) the pressure under which it is being expelled; and (4) the length of the tube. The first of these factors of course remains the same if one and the same gas is experimented upon under different conditions. The rate of transpiration is then found to be *directly* proportional to the density as well as to the expelling pressure, and to be inversely proportional to the length of the tube.

The phenomena of effusion and transpiration are essentially different from those of diffusion. In the former the gases move *in masses*, in diffusion they move *by molecules*. See Diffusion.

EFT, or **EVET** (AS. *efete*). A term formerly applied popularly and scientifically both to lizards and newts. It is now synonymous with newt, and in the United States red eft or evet is a local name of the spotted newt (*Diemyctylus miniatus*). See Newt.

ÉGALITÉ, ā'gȧ'lē'tā'. See Orleans, House of.

E'GAN, Maurice Francis (1852—). An American scholar, born in Philadelphia, and educated at La Salle College. In 1878 he became professor of English literature at Georgetown College, but subsequently was successively associated with *McGee's Illustrated Weekly*, the *Catholic Review*, and *Freeman's Journal*, of which he was chief editor from 1881 to 1888. Afterwards he became professor of English literature at the Catholic University, in Washington. His publications include a translation of Coppée's *Pater; That Girl of Mine* (1879); *Preludes*, a collection of poems (1880); *Songs and Sonnets* (1886); *The Life Around Us*, a collection of tales (1886); *Lectures in English Literature* (1889); *The Disappearance of John Longworthy; St. Martin's Summer* (1905); *The Ghost in Hamlet, and other Essays* (1906).

EGAN, Patrick (1841—). An Irish-American politician. He was born in County Longford, Ireland, and became the head of an extensive flour and grain business in Dublin. He was an ardent Nationalist, and took an active part in the Home Rule movement in 1871 and in the organization of the Irish Land League, of which, in 1879, with Justin McCarthy and Biggar, he was one of the first trustees. In 1880, with Parnell and others, he was tried in Dublin for conspiracy and sedition, and after the acquittal of the defendants he removed to Paris, and in 1883 to the United States, settling in Lincoln, Neb. He continued his connection with the Irish movement, and from 1884 to 1886 was president of the Irish National League of America. His testimony before the Parliamentary Commission in 1889 brought about the collapse of the London *Times's* case against Parnell. In the United States Egan took an active part in the Blaine campaign of 1884, and for his services in the campaign of 1888 was rewarded by President Harrison with the post of Minister Plenipotentiary to Chile. There his active advocacy of the cause of Balmaceda, the Liberal dictator in the Revolution of 1891, brought down upon him severe criticism in the United States. In the campaigns of 1896 and 1900 he left the Republican Party on the free-silver issue, and became a campaign speaker for his fellow-townsman, William Jennings Bryan.

EGAN, Pierce (1772-1849). An English writer. He was born in London, and by 1812 had attracted considerable attention there by his articles in the newspapers on country sports. A series of articles describing the amusements of sporting men in town which were published under the title *Life in London; or, the Adventures of Tom and Jerry* (1824), also became very popular among Londoners. This book was illustrated by George Cruikshank, was one of Thackeray's early favorites, and is said to have furnished the hint for Dickens's *Pickwick Papers.*

EGAN, Pierce (the younger) (1814-80). An English novelist and artist. He was born in London, and at an early age became successful as an illustrator. He is best known, however, as a novelist. His extravagant yarns were exceedingly popular for a time, as also were his numerous contributions to the 'penny-dreadful' papers of the day. Among his stories are: *Wat Tyler* (1851); *Snake in the Grass* (1858); *Eve: or, the Angel of Innocence* (1867); and *Love Me, Leave Me Not* (1860).

EGAÑA, ȧ-gä'nyȧ, Juan (1769-1836). A Spanish-American statesman and author. He was born in Lima, Peru, and was educated at the College of Santo Toribio, where he was made a tutor in philosophy. He practiced law at Santiago, Chile; became one of the leaders of the Revolution of 1810, and was elected a member of the first Chilean Congress. After the defeat of the Chilean army at Rancagua, in 1814, he was imprisoned by the Spaniards on the island of Juan Fernandez, but was liberated through the victory of San Martin at Chacabuco in 1817, when he was again elected to the Congress of Chile, of which he became President in 1823. He was considered one of the best writers of his day, and his literary works, published in ten volumes, include poems and educational text-books, as well as numerous essays on legal, political, and various other subjects. His *Cartas Pehuenchas* were translated into English by their author, under the title of *Pehuenchan Letters* (1819).

EG'BERT, or **ECGBERHT** (?-839). A king of the English. He was the son of Eahlmund, a king of Kent, and was descended from the early kings of the West Saxons. In his youth he was compelled to flee from England to avoid the hostility of Beorhtric, King of Wessex, and took refuge at the Court of Charles the Great. Here he remained probably for some thirteen years, until, in 802, he became King of the West Saxons. For the first thirteen years of his reign nothing is known of his acts. In 815 he conquered and laid waste Cornwall. Between 825 and 829 he subdued all the other kings in England, beginning with the ruler of Mercia, the most powerful rival of Wessex, and was recognized as Bretwalda. Kent, Sussex, and Essex were added to his kingdom and were ruled by his sons or nobles as under-kings. Northumbria, Mercia, and East Anglia were permitted to retain their self-government on acknowledging the supremacy of the West-Saxon King. For the first time Egbert brought all of the English peoples under one overlord. In his last years he had to contend against the Danes, by whom he was defeated in 835, and over whom he was victorious in 837. Consult: *Anglo-Saxon Chronicle* (where the dates, however, are given wrongly); Green, *The Making of England* (London and New York, 1881); id., *The Conquest of England* (London and New York, 1883).

EGBERT, James Chidester (1859—). An American archæologist and epigraphist, born in New York City. He graduated in 1881 at Columbia University, where he afterwards held tutorships in Greek (1885-87) and Latin (1888-95). He was adjunct professor of Latin at Columbia University from 1895 to 1900, in which year he was appointed to the chair of Roman archæology and epigraphy. His works include an edition of *Macmillan's Shorter Latin Course* (1892); *Cicero de Senectute* (1895); and *Introduction to the Study of Latin Inscriptions* (1895).

EGEDE, ā'ge-de, Hans (1686-1758). The first missionary to Greenland. He was born in Senjen, Norway, was educated at Copenhagen, and was settled as a Lutheran pastor at Vaagö from 1707 to 1717. A study of the Norse chronicles awakened in him a desire to visit Greenland, and convert to Christianity the descendants of the old Northmen, who he believed still lived there. In 1721, having secured the support of the Danish Government, he sailed for Greenland, but, on arriving, he found that the former Norse colonists had entirely disappeared. However, he resolutely turned his attention to converting and civilizing the Eskimos. From 1734 to 1740 he was principal of a seminary at Copenhagen, in which workers were trained for the Greenland mission, and in 1740 was made superintendent or bishop of the mission. He described his work in Greenland in *Det gamle Grönland's nye Perlustration* (1729), and is the author of a work on the natural history of Greenland, which has been translated into four languages.—Paul Egede (1708-89), his son, succeeded him in the Greenland mission, and, later, in the bishopric, translated the Gospels into the Greenland language, and compiled a grammar and dictionary for the use of the missionaries and colonists.

EGELHAAF, ā'gel-häf, Gottlob (1848—). A German historian, born at Gerabronn (Württemberg). He studied at Tübingen, in 1895 became rector of the Karlsgymnasium at Stuttgart, and in 1901 lecturer in the technical institute there. Important among his publications are *Kaiser Wilhelm I.* (3d ed. 1888) and *Deutsche Geschichte im Zeitalter der Reformation* (3d ed. 1893). He also wrote a popular manual, *Grundzüge der deutschen Litteraturgeschichte* (14th ed. 1900).

EGER, ā'gẽr (Bohemian *Cheb*). A town of Bohemia, situated on an eminence about 1450 feet above sea-level, at the foot of the Fichtelgebirge, on the Eger, 66 miles west-northwest of Pilsen (Map: Austria, C 1). The chief building of interest is the house of the burgomaster, or town hall, in which, on February 25, 1634, Wallenstein was assassinated. The hall contains a museum of local antiquities, pictures, and relics of the famous general. In an angle of the old fortifications above the river stand the ruins of the imperial castle built by Frederick Barbarossa. From their midst rises a peculiar square black tower, constructed of blocks of lava. The graceful double chapel is worthy of notice. Among the churches may be mentioned the fine large church of Saint Nicholas, founded in the thirteenth century. Eger has numerous educational and charitable institutions. Its manufactures include woolen, cotton, and other textile fabrics, machinery, and leather goods. About four miles to the north of Eger, and reached by a broad avenue, is the watering-place of Franzensbad (q.v.). Population in 1890 (commune), 18,658; in 1900, 23,665. Eger was founded probably at the beginning of the twelfth century, and came into the possession of Bohemia about 1320. The city suffered greatly in the wars of the Hussites, the Thirty Years' War, and the War of the Austrian Succession.

EGER, ĕg′ẽr. See ERLAU.

EGE′RIA (Lat., from Gk. 'Ηγερία). One of the Italian goddesses of streams or springs. She appears as the nymph of the stream in the grove of Diana at Aricia, and also as dwelling near the Porta Capena, at Rome, near the spot where Numa (q.v.) consecrated a grove to the kindred goddesses called Camenæ. Egeria is best known as the divine mistress or wife of Numa, whose inspiration and advice guided him in his reorganization of the ritual of the Roman State.

EGERTON, ĕj′ẽr-ton, FRANCIS. See BRIDGEWATER.

EGERTON, FRANCIS, Earl of Ellesmere. See ELLESMERE.

EGG (AS. *æg*, Icel. *egg*, OHG. *ei*, Ger. *Ei;* connected with OChurch Slav. *aye*, *yaye*, Lat. *ovum*, Gk. *ᾠόν*, *ōon*, egg). The present article proposes to consider the external characteristics, qualities, and utilities of the eggs of animals, and more especially of birds, leaving to the articles EMBRYOLOGY, REPRODUCTION, etc., their biological relations and development. All animals except Protozoa produce eggs, which are essentially single cells of protoplasm, containing a nucleus in which rests the potentiality of life, plus, in most cases, food-material and an integument. Eggs may be produced singly or in very small numbers at long intervals, or frequently and in great numbers; they may be so minute as to be invisible to the unaided human eye, or may exceed a foot in diameter; and in relative size, as compared with the parent, they may be nearly a quarter as large or less than a millionth; they may never leave the parent except as waste matter, or may be extruded, either before or after fertilization; finally, those which are 'laid' may be cast out wholly naked to take an infinitesimal chance of survival, or may be more or less well secured against harm by protective coverings, or even become objects of care and protection on the part of the parents.

EGGS OF BIRDS. The eggs of birds will be considered first, because they are typical, familiar, and of most interest to the general reader. They are the largest, relatively, to the size of the parent, of any in the animal kingdom, due to the fact that the embryos must reach a higher degree of maturity (and bulk) before hatching than among inferior classes of animals. The egg originates in the ovary, where, as the breeding season approaches, a number of them become greatly enlarged, and one by one break loose from the ovarian membranes and begin to descend the oviduct. They are at this time simply spheres of yolk surrounding a small quantity of germinal protoplasm (the nucleus of the original cell), which appears on the surface of one side, as the 'tread' of popular speech (see ALLANTOIS; EMBRYOLOGY), and covered with an almost imperceptible membrance, the vitelline membrane, formed from the protoplasm of the egg itself. Yolk or deutoplasm is a granular, fatty, nutritive material or highly compact food, stored in the egg for the nourishment of the young. It is of two kinds—white and yellow. The white yolk forms a thin film over the surface of the yellow yolk, and passes also under the germinative vesicle where it forms a sort of bed, and from this point extends downward to the centre of the yellow yolk. The egg is passed into the saclike mouth of the oviduct, and then descends into the oviduct itself, where it is, or may be, fertilized, and along which it descends in a slow spiral course.

Here the yellow ball begins to receive its outer coverings, the first of which is the 'white,' or albumen, which is poured out from glands, and consists of about 86 per cent. of water, 12 per cent. of proteids, 1.5 per cent. of fat, and a little salt. This 'white of the egg' is formed in concentric layers (as may be seen in a hard-boiled egg), the innermost of which is somewhat tenacious, and is drawn out by the spiral rotation of the egg in its progress into threads at the opposite poles. "These threads," writes Coues, "which become twisted in opposite directions, . . . are called *chalazæ;* they are the 'strings' rather unpleasantly evident in a soft-boiled egg, but serve the important office of mooring and steadying the yolk in the sea of white by adhesions eventually contracted with the membrane which immediately lines the shell. They are also intrusted with the duty of ballasting, or keeping the yolk right side up. For there is a 'right' side to the yolk-ball, being that on which floats the cicatricle or 'tread.' This side is also the lightest, the white yolk being less dense than the yellow; and the *chalazæ* are attached a little below the central axis. The result is that if a fresh egg be slowly rotated on its central axis the tread will rise by turning of the yolk-ball in the opposite direction, till, held by the twisting of the *chalazæ*, it can go no further; when, the rotation being continued, the tread is carried under and up again on the other side, resuming its superior position." The earliest embryologists (e.g. Fabricius ab Aquapendente 1600) attached considerable importance to the chalazæ and to certain white particles, the grandines, contained in them, because these structures were erroneously supposed to give rise to the embryo bird.

TYPES OF EGGS OF AMERICAN SONG BIRDS.

1. Flycatcher, olive-sided. 2. Flycatcher, vermilion. 3. Flicker, golden-shafted. 4. Sparrow, Henslow's. 5. Flycatcher, scissor-tailed. 6. Oriole, orchard. 7. Peewee, Say's. 8. Cow-bird. 9. Indigo bird. 10. Dick-cissel. 11. Night-hawk, Texan. 12. Swamp sparrow. 13. Veery. 14. Chewink. 15. Thrasher. 16. Meadow lark. 17. Raven. 18. Nut-cracker. 19. Wren, Bewick's. 20. Flycatcher, great crested. 21. Jay, California. 22. Flycatcher, ash-throated. 23. Finch, Lincoln's. 24. Blackbird, yellow-headed. 25. Flycatcher, scissor-tailed (variety). 26. Peewee, least or Chebec. 27. Kingbird, Western. 28. Grosbeak, black-headed. 29. Cuckoo, yellow-billed. 30. Seed-eater, black-faced. 31. Blackbird, red-winged. 32. Flycatcher, Acadian. 33. Grackle, boat-tailed.

The Egg-shell. The deposits of albumen are overlaid, when the egg arrives at the constricted neck of the uterus, by a membrane secreted by the lining of the oviduct, and formed of albumen mixed with felted fibres. This is the 'egg-pod' lining the shell. It is double, and by the separation of its two layers at one end the 'air-chamber' is formed. The egg, now five or six hours old, in the case of the common fowl, passes on into the uterine dilatation of the oviduct, where it rests for about 20 hours, and receives from numerous villi in the lining of the walls an even coating of a viscid fluid thickly imbued with lime, which rapidly crystallizes and compacts into a calcareous somewhat felted shell around the whole egg. This is attached at many separate points to the shell-membrane, leaving numerous minute spaces between them filled with air through pipe-like interstices in the shell. "Besides this mammillary and porous layer, the shell of most birds," according to Newton, "possesses a cuticular layer. This outermost layer is the most variable part of the shell; it is apparently structureless, either very poor in calcine salts, and in this case smooth and shiny, or considerably infiltrated with calcareous matter, and then exhibiting the well-known chalky and often rough appearance of the eggs of the ani, cormorants, grebes, and flamingoes. Even when well developed this cuticular layer is always extremely thin. In the ostrich and in rhea it is hard and brittle, like the glaze of pottery; in the common fowl and turkey it is parchment-like; in auks and apparently in gulls it is absent. The cuticle is spread over the whole surface of the egg, and into the pits or surface-ends of the air-canals, which are therefore closed when such a cuticle is present. The latter, however, readily admits the passage of air when dry, but when wet or moist is impermeable to air." The very great differences observable in the surface of eggs, from rough and pitted to enameled, or polished, or translucently brilliant, is due to the varying crystalline structure of the shell. This has been very thoroughly worked out by German microscopists, whose extensive investigations are recorded in the *Journal für Ornithologie* for 1871 and subsequently, and who have shown that a well-defined type of shell-structure belongs to each of various groups. Further information is given in the *Zoologischer Anzeiger* (1885-87).

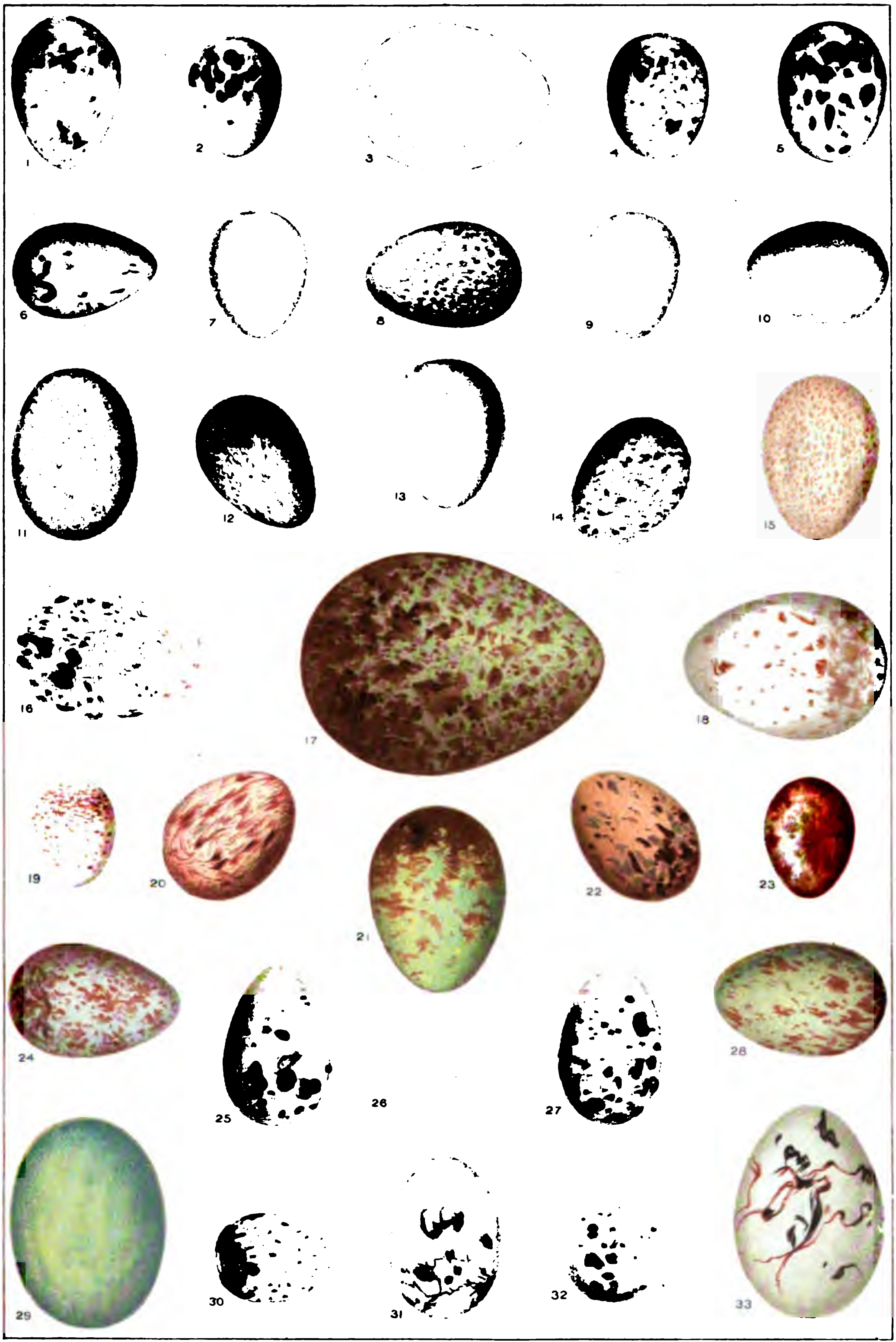
The porosity of the shell is needful, of course, in order to admit air to the embryo; and the pores are large enough to admit also some bacteria, so that after a short time eggs not energized by vital processes become corrupt and rotten. The various preservative processes that have been attempted to prevent decay depend for their success upon the complete exclusion of bacteria, and only succeed when they are begun before any infection has been received, and when they absolutely close all the pores of the shell. This can best be done by soaking in lime-water, in effect reinforcing and completing the natural shell.

Number and Size of Eggs. The number of eggs that constitute a 'clutch' or 'set' is fairly uniform with each species, but differs greatly among different species. Pelagic water-fowl, and the larger birds of prey usually lay only one egg, rarely more than two; many game birds and lake and river fowl lay a dozen; woodland and field birds average five, though in some species two or three are prevailing numbers, and in others, for example titmice, the clutch may consist of ten eggs. The number of eggs laid, except in cases correlated with peculiar circumstances in life history are so nearly constant among species of similar habit and bear so evident a relation to the average comparative danger to which the species is exposed, that naturalists recognize evidences of a seeming general principle which governs the size of the brood, and if any peculiarity should appear in the nesting or the rearing habits that might accrue to the welfare of the individual species, it is offset by a reduced reproductive power.

Another noteworthy fact is that great diversity exists in the size and weight of eggs as compared with the size and weight of the mother bird. Hewitson states, for example, that the raven and guillemot are of about equal size, but their eggs vary as four to one, the latter's being as big as those of an eagle. Still more remarkable for disproportionate bigness are the eggs of the Australian mound-birds, which measure 3¼ by 2⅛ inches, though the hen is only about the size of a common fowl; and of the extinct moas, epiornis and the existing kiwis (Apteryx), that of one of the kiwis weighing nearly one-fourth as much as the hen which produces it. Much individual variation exists, and several factors seem to enter into the explanation; but in general eggs much larger than ordinary, relatively to the size of the mother, belong to birds whose precocial young will receive little or no help and care from their parents after birth, and hence must remain within the protection of the egg until they are considerably advanced toward maturity. This requires a very much larger egg than is needed for the early-born, parent-supported, altricial birds, since a much greater quantity of food (yolk) must be stored up for them, and they must have room to grow. It is plain that few such eggs can be produced from the resources of the mother's organization, and as a matter of fact these huge eggs are laid singly; as a rule, relatively large eggs mean few in a brood.

Shape. In shape birds' eggs are rarely spherical, though the contained yolk is always so, but ordinarily is 'ovoid,' being much larger at one end than the other, and often nearly conical; while some are oblong, having a decided length but no excess of thickness at either end. Eggs laid in holes or deep, cup-like nests, where they cannot fall out, are likely to be spherical or ovoid; while those laid upon the ground, with little or no nest, are usually conoid, and likely to be large for the size of the bird. This shape gives them two advantages: first it enables them to lie more closely together, the points toward a common centre, so that they are easily covered by the brooding bird; and, second, in the case of eggs, like those of guillemots, which are laid upon bare ledges of sea-cliffs with no encircling nest. the conical shape prevents their being easily rolled or blown away when uncovered, because when moved they will tend to gyrate upon their points and not roll away. Among the services which the egg-shell performs the foremost is the protection of the embryo from injurious changes of temperature and from too much light. See Growth.

EGGS OF AMERICAN SONG-BIRDS



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

FOR NAMES AND DESCRIPTIONS SEE TEXT.

COLOR. Birds' eggs may be said to be normally chalky white, but in a great number of groups they are colored. The color may be a uniform tint over the whole surface, or a tint with markings; or simply dots, spots, streaks, or blotches of one or more hues on an otherwise colorless shell. These colors exude from uterine glands in the form of pigment-corpuscles deposited with the forming shell, and stain its deeper as well as its more external layers. Many of the variations in tint of the spots are thus due simply to their being overlaid by more or less transparent material, but certain real colors exist. This matter was studied by H. C. Sorby by the methods of spectrum analysis described by him in the *Proceedings of the Zoölogical Society of London* for 1875. He learned that the coloring matters in egg-shells are connected with hæmoglobin and the bile-pigments, and are definite physiological products. He reported seven of these products as follows:

(1) *Oörhodeine.* The most important of the colors, present in almost all eggs, which gives an effect when alone of brownish red. The spectroscope shows so close a similiarity between this and the product of the decomposition of the red corpuscles of the blood as to make it probable that they are physiologically identical, and derived from the same source. Such red-brown eggs as those of the grouse are mainly tinted by this material.

(2) *Oöcyan.* A fine blue.

(3) *Banded Oöcyan.* Also a fine blue, but giving a different spectrum. A chemical similarity is apparent between the two oöcyans and the pigments of the bile, and they must be regarded as derived by separate physiological processes from the same source.

(4) *Yellow Oöxanthine.* Clear yellow; unstable and liable to fade.

(5) *Rufous Oöxanthine.* Reddish yellow.

(6) *A substance giving narrow absorption-bands in the red.* Probably brown.

(7) *Lichenoxanthine.* A brick-red substance, apparently identical with a coloring matter common in plants, especially in lichens and fungi.

The mixture of these pigments in various ways gives the varied colors observed in egg-shells. Thus the nightingale's egg has been shown to be colored with a mixture of oörhodeine and oöcyan; while all the varying greens and blues so common as ground-tints are due to varying mixtures of oöcyan with oöxanthine, and such are likely to fade or to change color when long exposed to the light.

An interesting feature in this connection is that not only the state of health, but the state of mind of a bird, may affect the colors of its eggs, as Hewitson long ago recorded.

THEORIES OF COLOR-MARKINGS ON EGGS. The reason for the many and various colorings of birds' eggs has been a favorite field of speculation, and many ingenious theories have been constructed to explain the matter, from the pious musings of Sir Thomas Browne to the present day. The most important thesis is that advanced by Wallace and enlarged by Poulton, who attempt to show that birds' eggs are examples of protective mimicry in color, as the result of natural selection. Impartial examination shows, however, that only in a minority of cases does the theory of adaptive coloration seem to be adequate and not open to serious interference from other explanations or contradictions: such favorable cases are those of the nightjars, game birds, shore birds, coots, and some other ground-builders making scanty nests, whose eggs certainly do closely simulate the beach, or leaves, or marsh-grass upon which they lie. They are certainly very difficult to see, especially for human eyes; but most of the despoilers of birds' nests are not human, but brute foes which, for the most part, depend less upon their eyes than upon their noses to discover what they seek, and most of which go about by night rather than by day. Against such foes color is of small importance among the factors of safety. It is quite probable that in the cases above mentioned the inconspicuous coloring of the eggs is of some consequence, and may be the result in some degree of natural selection; but these cases are only a small part of the whole array of bird life, and "protective coloration" certainly fails as yet to account for the coloring of birds' eggs as a whole.

TYPES OF EGGS OF WATER AND GAME BIRDS.

1. Pintail duck. 2. Petrel, stormy. 3. Darter. 4. Rail, Virginian. 5. Night-heron. 6. Partridge, Gambel's. 7. Phalarope, Wilson's. 8. Ibis, white. 9. Sandpiper, spotted. 10. Coot. 11. Dove, Zenaida. 12. Ptarmigan, willow. 13. Kildeer (plover). 14. Bittern, American. 15. Tern, arctic.

It is much more likely that this phenomenon falls under the theory of 'recognition' colors. Many facts go to show that birds recognize their own eggs, and the supposition is reasonable that the tints and markings, if they serve any useful purpose at all, serve that of identification by their owners. This would account for the fact that eggs laid in dark holes are usually white; and it would explain the individual variation within the limits of specific or tribal likeness which universally characterizes the eggs of birds.

UTILIZATION OF BIRDS' EGGS. Eggs being intended not only for the production of new beings, but for their nutrition during the embryonic period, mainly consist of a store of highly nutritious material, which is as good food for other animals as for the young birds. Hence all eggs may be called edible, though some are so impregnated with a fishy or musky flavor or odor as to be unpalatable to civilized mankind. The vast use made of the eggs of domestic fowls as food and in the arts is elucidated in another article (see EGG AS A FOOD), but attention may be called here to the fact that in many parts of the world the gathering of the eggs of birds, mainly sea-birds, which nest in vast communities, is a regular industry furnishing an important part of the food of the local population. This is especially true of high northern regions. In some of the islands of the Pacific eggs of gregarious sea-fowl are gathered by thousands, for the purpose of making from them commercial albumen; but this industry is diminishing by reason of the steady depletion of the numbers of the sea-fowl thus disturbed and robbed. The making of collections of egg-shells for scientific museums, and still more for the satisfaction of private curiosity and ambition, has long been an industry in which much money is annually expended, rare eggs often commanding very high prices, the few eggs remaining of the extinct great auk (q.v.) being worth at present more than $2000 each. Lastly it is to be mentioned that in the season when birds are breeding their eggs and fledglings form an important part of the food of many other animals.

MAMMALIAN EGGS. The eggs of all the mammals except the monotremes (q.v.) are minute globules (that of human beings being only about $\frac{1}{200}$ of an inch in diameter) containing little yolk, which pass through all their stages of development within the body of the mother. (See EMBRYOLOGY.) The two groups of monotremes, the duckbills and echidnas (qq.v.), however, are ovoviviparous, that is, they produce eggs which are voided from the mother and developed outside her body. These eggs are very much larger than those of other mammals, because they must carry a comparatively large amount of yolk-food. Those of the duckbill, two in number annually, are globular, about three-fourths of an inch in diameter, and have a tough yellow calcareous shell; they are deposited in a soft nest in the animal's burrow and hatch there. The echidna produces one egg a year, one-half to three-quarters of an inch in diameter, and covered with a leathery envelope (keratin), which is placed as soon as voided in a mammary pouch and there completes its development.

EGGS OF REPTILES AND AMPHIBIANS. Most reptiles are oviparous, laying eggs, either globular or oblong in shape, closely resembling birds' eggs in composition of yolk, albumen, and coverings, except that the shell is not calcareous, but of a tough, yellowish-white, parchment-like (coriaceous) material. "These are usually deposited in holes and left to hatch by the heat of the sun. In the [case of] the crocodiles they are deposited in a rough nest, and guarded by the mother. In all cases development has only progressed to a very early stage when the deposition of the eggs takes place, and it is only after a more or less prolonged period of incubation that the young, fully formed in every respect, emerge from the shell and shift for themselves." These eggs are most numerous in the case of the turtles, numbering from 25 to 250, and are buried in the sand of sea-beaches and river-banks. Those of the fresh-water species are mostly nauseous, but the eggs of sea-turtles are excellent food, will keep fresh a long time, and are extensively gathered, the people of many tropical countries subsisting largely upon them in their season. They are also much fed upon by wild animals. Many lizards and serpents do not lay eggs, but are viviparous; but the pythons not only lay them, but incubate them within the circle of their coiled bodies.

THE EGGS OF THE AMPHIBIANS. These differ from eggs of reptiles in being small, numerous, having comparatively little food-yolk, and are usually laid in the water inclosed in gelatinous masses or cords. Sometimes they float or lie upon the bottom, or attached to submerged plants, or are laid under logs or stones; and in a few cases they are carried about by one or the other parent until they hatch, or the mother coils about them in an underground cell. They are devoured by some aquatic animals.

EGGS OF FISHES. The fishes may be broadly divided into 'cartilaginous' and 'bony,' which differ essentially in respect to their eggs. The cartilaginous fishes—sharks, rays, etc. (qq.v.)—produce in each case only a few eggs, which are proportionately nearly as large as those of birds or reptiles, and which, like those, are inclosed in protective envelopes and contain much yolk and semi-liquid albumen. Some species are viviparous. In those which extrude their ova in a more or less advanced stage of development each egg is covered by a dark-brown chitinous case, which most commonly is flat and four-cornered, with twisted filamentous appendages at the corners, by means of which it becomes attached to seaweeds and the like. These are the 'sea-purses' of fishermen.

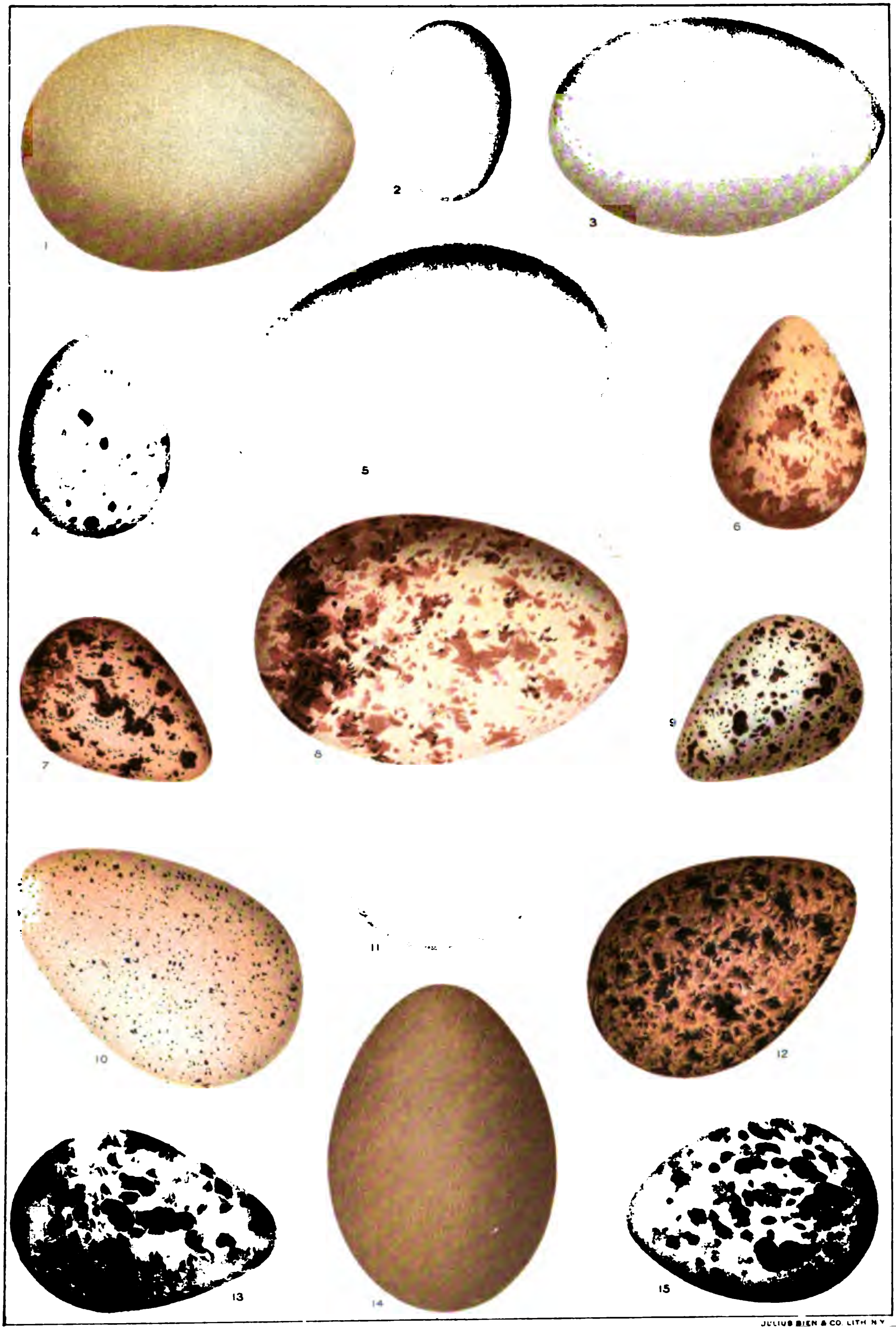
The *bony* fishes mostly emit minute eggs, usually called 'spawn,' in vast quantities, a single sea-fish producing two or three hundred thousand in some cases. These are cast into the water and contribute a large part of the food-supply of aquatic creatures, nineteen-twentieths, probably, being quickly devoured. Some float at or near the surface; others sink to the bottom. Some fresh-water fishes, however, deposit their eggs in prepared nests, where they are guarded and attended until they hatch. (See NIDIFICATION.) This reduces the proportion of loss so greatly that comparatively few need be produced, and they are far larger, relatively, than in the other case. The eggs of such fishes as the shad, under the name of 'roe,' and of the sturgeon (caviar), enter largely into the list of human comestibles.

EGGS OF INSECTS. Eggs and their deposition among the insects present a great variety of interesting phenomena, of which only a sketch may be given here. In many cases in this class the eggs are so carefully placed as to insure the survival of almost every one, and in proportion as the precautions are complete the number periodically laid is diminished; in fact, in nearly all cases, except in the Hymenoptera, each egg, or else a group of eggs, is within a strong shell or capsule.

Bees, wasps, and ants lay relatively large, elliptical, shell-less eggs, usually each by itself, in the cells of their combs or burrows, placing with them food for the expected larvæ (honey, bee-bread, palsied spiders, etc.). Other insects place them within or upon the bodies of other insects, as is the habit of the parasite ichneumons and chalcidids; or insert them into plant-tissues and wood, as do the gall-flies, sawflies, etc. Many flies produce living larvæ, and others retain their eggs until nearly mature. The bottle-shaped eggs of mosquitoes stick together in a sort of cake or raft that floats on the surface of water; those of the midges are imbedded in jelly, which swells in the water and sticks to a support; the buffalo-gnats glue theirs in large patches to submerged rocks. The snipe-flies, gadflies, and some others put their eggs on dried branches overhanging the water, sometimes in large pear-shaped masses to which several females contribute, and many others force theirs into the ground or into decaying wood or dung, carrion meat, or wounds, as is the case with house-flies, flesh-flies, syrphus-flies, etc.; while the bots attach theirs to animal hairs, where they may be licked off and develop in the stomach of their host. It is clearly impossible to carry this particular description through the list. One of the longest as well as most entertaining chapters in the admirable *Introduction to Entomology*, by Kirby and Spence, is filled with such details. An excellent summary has been made by Carpenter as follows:

"The outer form of insects' eggs is exceedingly variable. Very many—as those of beetles, grasshoppers, and flies—are elongate, like the cockroach's. The eggs of some moths are globular, while those of butterflies, and especially those of

EGGS OF AMERICAN WATER AND GAME-BIRDS



COPYRIGHT, 1902, BY DODD, MEAD & COMPANY

JULIUS BIEN & CO. LITH. N.Y.

FOR NAMES AND DESCRIPTIONS SEE TEXT.

bugs, assume graceful, flask-like shapes and elegantly sculptured surfaces. Other insects—the golden-eye flies, for example—produce stalked eggs, which are raised well above the plant-stem on which they are laid, and so protected from mites and other enemies. Insect-eggs contain a quantity of food-yolk, and are therefore of comparatively large size. The globular egg of the hawkmoth, for instance, measures $\frac{1}{20}$ inch in diameter, while the similarly shaped egg of a cat measures only $\frac{1}{120}$ inch. The cockroach's eggs are protected by a purse-shaped capsule. Sixteen eggs are contained in this case, eight on a side. . . . Many insects protect their eggs by a gummy secretion; some female moths shed hairs from their bodies to afford the eggs a covering. Those of the water-insects are often contained in a long gelatinous tube, and some water-beetles construct around their eggs a silken cocoon. Locusts, grasshoppers, and many other insects bury their eggs in the ground for safety; other insects—chafers and crane-flies, for example—lay their eggs in the ground that the young may be near the roots of plants on which they will feed. Almost universally the food of the young determines the place of egg-laying."

It is an interesting fact that in elliptical eggs of insects the forms of the larvæ or adult, i.e., their dorsal, ventral, and lateral surfaces, are foreshadowed in the shape of the egg.

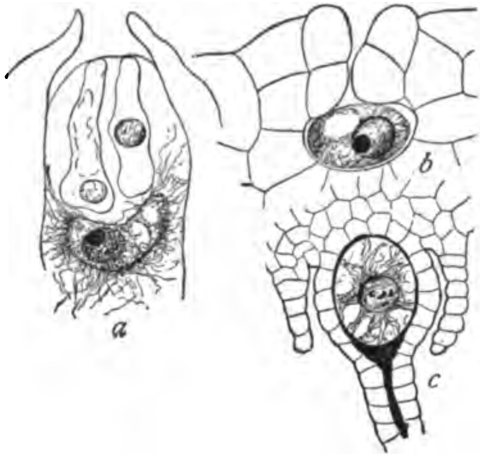
Eggs of Crustacea. Some crustaceans produce masses of agglutinated eggs, which the female carries about with her, attached to her abdominal appendages, until they hatch. Others lay comparatively few eggs, which are carried about by the female in one or two special sacs; while many simply set their numerous small eggs free in the water.

Eggs of the Lower Invertebrates. The eggs of the squids and other cephalopod mollusks are enveloped in a tough viscid membrane, and stick together in masses, called 'sea-grapes,' which adhere to some fixed object. They contain much food-yolk, and the young are well advanced before leaving the shell. Among the ordinary univalved and bivalved mollusks a greater variety in respect to eggs is to be met with than might be expected. The bivalves (Pelecypoda) pour out immense quantities of minute eggs and spermatozoa into the water, to meet if they can. A large proportion of this will be wasted, but a still larger proportion (with the floating eggs of other low marine creatures) serves a very useful purpose in supplying food to the hosts of fixed creatures (polyps, sea-anemones, other mollusks, etc.), which can obtain food only as it is brought to them by currents of water, and must trust largely to floating eggs and young. Only a very small percentage is fertilized, and a still smaller part ever matures. An exception is afforded by the fresh-water mussels, which keep their eggs within their shells, inclosed within the gills and mantle, and so protect them. Among gastropods the eggs are comparatively few and well cared for. "In almost all the Gastropoda," say Parker and Haswell, "fertilization is internal, and the eggs are laid in great masses imbedded in jelly—each egg having its own hyaline envelope. Very often the mass of spawn, consisting of the jelly-like substance, with the eggs imbedded in it, attains a relatively considerable size. In form it varies greatly; very often it is in the shape of long strings, which are cylindrical or band-like; sometimes several such strings are twisted together into a cord. Sometimes the spawn is fixed to seaweed or other objects; sometimes it is unattached and may float about freely. In the Streptoneura, instead of a jelly-like mass, the eggs are inclosed in a firm parchment-like capsule, in which is contained, in addition to the eggs, a quantity of an albuminous fluid, serving to nourish the developing embryos. . . . Very commonly large numbers of these capsules are aggregated together, and usually they are attached to a rock or a seaweed or similar object. . . . In the land Pulmonata (snails) each ovum is sometimes imbedded in gelatinous matter inclosed in a firmer envelope, and a number of them are arranged in a string; sometimes a larger number are imbedded in a rounded gelatinous mass. Usually, as in Helix and other genera, the outer layers of the albumen-like substance inclosing the eggs become toughened and impregnated with salts of lime, so as to assume the character of a calcareous shell."

The Annelids (Annulata) have comparatively large ova, and each has a double gelatinous envelope and contains food-yolk; some cast them abroad; by many they are inclosed in packets or cocoons (as is the case in the earthworm), or stick together or to the parent or to some outside object. The egg of the flatworms has a protective chitinoid integument, contains food-yolk, and sometimes (as among mollusks, insects, etc.) has an operculum facilitating the escape of the matured embryo; also external cement for attachment to other eggs or to some fixed object. The same is true of nematodes, which oviposit vast numbers of eggs—15,000 a day, it is stated. The Trochelminthes (rotifers) lay eggs of three kinds, those produced in the autumn having thick shells to enable them to survive the winter and develop in the spring. Polyzoans and brachiopods produce very few eggs at a time, and these are developed into larvæ in 'brood-pouches' within the body. The eggs of echinoderms are minute globules, consisting of germ-cell, food-yolk, and a glassy exterior layer. They are generally set free in the water, where they are fertilized and developed. Sometimes they stick to the surface upon which they are laid, and develop there. The eggs of cœlenterates and sponges are hardly worthy of the name, being merely microscopic germ-cells, set free in vast quantities as one of several means of reproduction.

Bibliography. *Standard Natural History* (6 vols., Boston, 1885); Parker and Haswell, *Text-Book of Zoölogy* (London and New York, 1897); Flower and Lydekker, *Mammals, Living and Extinct* (London, 1891); Newton, article "Eggs," with many bibliographical references, in *Dictionary of Birds* (London, 1893-96); Wallace. *Darwinism* (London, 1889); Poulton, *Colors of Animals* (London and New York, 1890); Ingersoll, "A Bird's Egg," in *Harper's Magazine* (New York, December, 1897); Gunther, *Study of Fishes* (London, 1880); Publications United States Fish Commission (Washington, 1875 to the present); Kirby and Spence, *Introduction to Entomology* (London, 1828); Carpenter, *Insects: Their Structure and Life* (London, 1899); Packard, *A Text-book of Entomology* (New York, 1898).

EGG. In plants, the more technical term for the egg is 'oösphere.' Among the lowest plants in which sexuality is developed, such as the lower algæ and fungi, the two sex-cells (gametes) do not differ in appearance, a condition which is called 'isogamy.' Most plants, however, are not isogamous, but their pairing gametes are very dissimilar. The male gamete, called the sperm, is small and usually motile by means of cilia; while the female gamete, called the egg, is relatively large and passive. Plants with such dissimilar gametes are said to be 'heterogamous.' Both sperms and eggs are single, naked cells, but the former are characterized by their activity, the latter by their food-supply. As in all living cells, the egg consists of a nucleus invested by more or less cytoplasm, in this case the cytoplasm being conspicuous in amount and containing an abundance of reserved food. Usually a special organ is set apart to develop within itself a single egg. Among algæ and fungi this female organ is generally a single spherical cell, and is called the 'oögonium'; among the bryophytes (mosses and their allies), pteridophytes (ferns and their allies), and gymnosperms (conifers and their allies), the female organ is a many-celled, flask-shaped structure called the 'archegonium,' in whose venter (the bulbous part) the egg is organized; while among spermatophytes (seed-plants) there is no female organ, the egg appearing as a free cell in the embryo-sac which is imbedded in the ovule. In most cases a solitary egg is formed by a sex-organ, in which it passively remains till fertilized by the spore, but there are some interesting exceptions. For example, in the common rockweed (Fucus), a brown alga of the seashore. some of the species have oögonia which produce eight eggs, that are discharged into the water for fertilization. Under ordinary circumstances, an egg must unite with a sperm, that is, it must be fertilized before it can accomplish anything. The new cell thus formed by the fusion of two cells is known as the 'oöspore' or 'fertilized egg.' Occasionally, however, an unfertilized egg may produce a new plant, the phenomenon being known as 'parthenogenesis.' Parthenogenesis is rather common among the lower plants, and it is not entirely unknown even among seed-plants, although its occurrence there has been reported in very few forms. See EMBRYO; CELL; CYTOLOGY; SPERM; PARTHENOGENESIS; FERTILIZATION.



EGG:
a, of club-moss; b, of fern; c, of liverwort.

EGG. As a food, perhaps no article of animal origin is more common in all countries or served in a greater variety of ways. Hens' eggs are most popular, although the eggs of ducks, geese, and guinea-fowls are used to some extent. More rarely turkeys' eggs are eaten, but they are generally of greater value for hatching. The eggs of the lapwing (q.v.), called 'plover-eggs,' are prized in England and Germany, while the eggs of sea-birds have long been gathered for food. Other eggs besides those of birds are sometimes eaten. Turtle-eggs are highly prized in most countries where they are abundant. The eggs of the terrapin are usually served with the flesh in some of the ways of preparing it for the table. Fish-eggs, especially those of the sturgeon, under the name of caviar (q.v.), are eaten in large quantities, preserved with salt. Shad-roe is also a familiar example of the use of fish eggs as food. Mention may also be made of the use by some races of the eggs of alligators, lizards, serpents, and various insects.

COOKING OF EGGS. The methods of serving eggs alone, or in combination with other food materials, are very numerous. Cooked in various ways they are a favorite animal food, taking the place of meat to a certain extent, while raw eggs, usually seasoned in some way, are by no means infrequently eaten. Boiled eggs are often used for garnishing or ornamenting different foods. Eggs are combined with other materials in various ways in many made dishes. They are used in making cakes and such foods to improve the flavor, color, and texture, while in custards, creams, etc., they thicken the material and give it the desired consistency. The white of the egg is employed in making icings and confectionery. Well-beaten egg-white incloses air in small bubbles, which in mixing become distributed throughout the mass of dough of cakes and similar foods. The heat of cooking expands the bubbles, which become firm; the porous structure is retained, thus improving both the texture and flavor of the product. The power of eggs to inclose and retain air, when beaten, varies, being greatest in the fresh egg and much less in packed or old eggs. There are several simple ways of cooking eggs which are very commonly followed. Thus, the egg in the shell is cooked by immersion in hot or boiling water, or is less commonly roasted; or after removal from the shell, the egg is cooked in hot water or in hot fat. In the latter case it may or may not be beaten or stirred. Combined with other materials to form variously made dishes, eggs are boiled, baked, steamed, or fried, as the case may be. The total number of methods of serving and preparing eggs is very large, but in nearly every case it will be found that the method of preparation is only a more or less elaborate modification of one of the simple methods of cooking. When cooked in different ways there are marked changes in the appearance and structure of eggs. If the egg-white is gently warmed no change is noticed until the temperature reaches 134° F., when coagulation begins. White fibres appear, which become more numerous, until at about 160° F. the whole mass is coagulated, the white almost opaque, yet tender and jelly-like. If the temperature is raised and continued to 212° F. (the temperature of boiling water), the coagulated albumen becomes much harder, and eventually more or less tough and horn-like; it also undergoes shrinkage. When the whole egg is cooked in boiling water the temperature of the interior does not immediately reach 212° F., several minutes being probably required. The yolk of egg coagulates firmly at a lower temperature than the white. The fact that egg-white becomes hard and contracts when heated for some time, at the temperature of boiling water, explains the curdling of custards, shrinkage and toughening of omelets, soufflés, meringues, sponge cake, and similar mixtures. The firm coagulation of albumen at 212° F. explains the use of egg-white for clarifying coffee, soup, or other liquids. The albumen, which is mixed with the liquid before boiling, coagulates and incloses the floating particles, leaving the liquor clear. When eggs are removed from the shell, a little of the white, unless scraped off, usually clings to the inner surface. Such egg-shells are often used for clarifying purposes, instead of the whole egg. The clarifying properties are, of course, due to the egg-white, and not to the shells. Large quantities of egg-white are used for other purposes than for food, such as for manufacturing photographic papers; the yolks also are utilized in the arts.

CHARACTERISTICS AND COMPOSITION. The eggs of different kinds of domestic poultry vary in size, as well as appearance, and there is also a considerable range in the size of eggs of different breeds. On an average, a hen's egg is 2.27 inches in length and 1.72 inches in diameter, or width, at the broadest point, and weighs about two ounces, or eight eggs to the pound (1½ pounds per dozen). Generally speaking, the eggs of pullets are smaller than those of old hens, those of ducks somewhat larger than hens' eggs, while those of turkeys and geese are considerably larger. Guinea-eggs, on an average, measure 1⅞ by 1½ inches, are rather pointed at one end, and weigh about 1.4 ounces each, or 17 ounces to the dozen. Goose-eggs weigh about 5.5 to 6.7 ounces each, or about 5 pounds to the dozen —that is, more than three times as much as hens' eggs. The eggs of wild birds are said to be smaller than those of the same species when domesticated. Wild ducks' eggs are, on an average, 1.97 to 2.17 inches in diameter; domestic ducks' eggs, 2.36 to 2.56 inches. The shells of hens' eggs constitute about 11 per cent., the yolk 32 per cent., and the white 57 per cent. of the total weight of the egg. White-shelled eggs have a somewhat heavier shell than brown-shelled eggs. The shell of a duck's egg constitutes about 14 per cent. of the total weight, and that of a plover's egg 10 per cent. The following table shows the composition of the eggs of poultry and the plover, and, for comparison, that of evaporated hens' eggs, egg substitute, and pudding powder:

TABLE SHOWING AVERAGE COMPOSITION OF EGGS AND EGG PRODUCTS

	Water	Protein	Fat	Carbohydrates	Ash	Fuel value per pound
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Calories*
Hen:						
Whole egg, edible portion	73.7	13.4	10.5	See following paragraph.	1.0	720
White	86.2	12.3	0.2		0.6	250
Yolk	49.5	15.7	33.3		1.1	1705
Duck:						
Whole egg, edible portion	70.5	13.3	14.5		1.0	860
White	87.0	11.1	0.03		0.8	210
Yolk	45.8	16.8	36.2		1.2	1840
Goose:						
Whole egg, edible portion	69.5	13.8	14.4		1.0	865
White	86.3	11.6	0.02		0.8	215
Yolk	44.1	17.3	36.2		1.3	1850
Turkey:						
Whole egg, edible portion	73.7	13.4	11.2		0.9	720
White	86.7	11.5	0.03		0.8	215
Yolk	48.3	17.4	32.9		1.2	1710
Guinea Fowl:						
Whole egg, edible portion	72.8	13.5	12.0		0.9	755
White	86.6	4.6	0.03		0.8	218
Yolk	49.7	16.7	31.8		1.2	1655
Plover:						
Whole egg, edible portion	74.4	10.7	11.7		1.0	695
Evaporated hens' eggs	6.4	46.9	36.0	7.1	3.6	2525
Egg substitute	11.4	73.9	0.3	5.3	9.1	1480
Pudding (custard) powder	13.0	2.1	3.4	80.9	0.6	1690

Eggs consist chiefly of two nutrients—protein and fat—in addition to water and mineral matter or ash. Carbohydrates are present in such small amounts that they are usually neglected in the analysis. The results of numerous analyses show that there is practically no difference in composition between hens' eggs with dark shells and those with white shells, although there is a popular belief that the former are 'richer.' In general, it may be said that eggs are nutritious food. They are less concentrated —i.e. contain more water—than cheese, but are more concentrated than milk or oysters. In water content they do not differ greatly from the average value for lean meat. The kinds and amounts of nutrients in eggs indicate that they may be properly used in the diet in the same way as most other animal foods, and this belief is confirmed by experience.

FOOD VALUE. Eggs which are perfectly fresh have the finest flavor. After eggs have been kept for a time the flavor deteriorates, even if there be no indication of spoiling. Such differences are especially important when eggs are used for table purposes. Stale eggs are regarded as not palatable, and the flavor of spoiled eggs is such that, because of it, if for no other reason, they are totally unfit for food. The flavor of even perfectly fresh eggs is not always satisfactory, since it is influenced more or less by the character of the food eaten by the laying hens, onions and some other highly flavored feeds imparting an unpleasant flavor to the eggs. The flavor is also impaired when the air in which the eggs are stored is tainted by odors such as those of decaying vegetables, rancid fats, and gases of various kinds.

Raw eggs or eggs only slightly cooked are commonly said to be very digestible, the idea being obviously that they digest readily without giving rise to pain or other physical discomfort. This is in accord with the results of numerous experiments, which show that the length of time that eggs are cooked affects somewhat the time required for digestion, and that some 95 per cent. of the total dry matter and 97 per cent. of the protein of eggs is digestible. It seems fair to conclude that the length of time of cooking has less effect upon the percentage amount that may be digested than upon the time required for digestion. In a healthy man, the latter consideration is probably not a matter of much importance; in the diet of sick persons and invalids, it may be more important. From the results of numerous dietary studies, it appears that eggs furnish 3 per cent. of the total food, 5.9 per cent. of the total protein, and 4.3 per cent. of the total fat used per man per day in the average American family. In this respect, eggs compare favorably with the more common animal foods.

Marketing and Testing. In earlier times eggs, if sold at all, were marketed near the place where they were produced. Many are still sold in local markets; but with improved methods of transportation the market has been extended, and large quantities of eggs are shipped from the United States and Canada, not only to distant points in America, but to England and more distant countries. For shipping long distances, there are special egg-cases. Eggs which are to be shipped, whether with or without a special attempt at preservation, should be perfectly fresh, and should never be packed in any material which has a disagreeable odor. Micro-organisms enter the egg through the minute pores in the shell, and set up fermentation, which ruins the egg. In other words, it becomes rotten. The unpleasant odor of rotten eggs is due to the formation of sulphureted hydrogen. The normal egg-shell has a natural surface coating of mucilaginous matter, which hinders the entrance of these harmful organisms for a considerable time. If this coating be removed or softened by washing or otherwise, the keeping quality of the egg is much diminished. If the process of hatching has begun, the flavor of the egg is also injured. There are many ways of testing the freshness of eggs which are more or less satisfactory. 'Candling' is one of the methods most commonly followed. The eggs, when held against a light in a suitable device, appear unclouded and almost translucent when fresh, and dark-colored if they are addled. A dark spot may be observed if incubation has begun, which increases in size according to the stage to which incubation has advanced. The age of eggs may be approximately judged by taking advantage of the fact that, as they grow old, their density decreases through evaporation of moisture. According to Siebel, a new-laid egg placed in a vessel of brine made in the proportion of two ounces of salt to one pint of water will at once sink to the bottom. An egg one day old will sink below the surface, but not to the bottom, while one three days old will swim just immersed in the liquid. If more than three days old, the egg will float on the surface, the amount of shell exposed increasing with age; and if two weeks old, only a little of the shell will dip in the liquid.

Methods of Preservation. Fresh eggs are preserved in a number of ways, which may, for convenience, be grouped under two general classes, which are often combined: (1) Use of low temperature, i.e. cold storage; and (2) excluding the air by coating, covering, or immersing the eggs, some material or solution being used which may or may not be a germicide. The first method owes its value to the fact that micro-organisms, like larger forms of plant life, will not grow below a certain temperature, the necessary degree of cold varying with the species. It is stated by Siebel that, in practice in the United States, 32° to 33° F. is regarded as the best temperature for storing eggs, although some American packers prefer 31° to 34°. English writers recommend a temperature of 40° to 45° as being equally satisfactory. Without doubt the amount of moisture in the air in the cold-storage chamber has an important bearing on this point. Eggs are generally placed in cold storage in April and the early part of May; if later than this time they do not keep well. They are seldom kept in storage longer than a year. Eggs which have been stored at a temperature of 30° must be used soon after removal from storage, while those stored at 35° to 40° will keep for a considerable time after removal from storage, and are said to have the flavor of fresh eggs. Stored eggs should be turned at least twice a week, to prevent the yolk from adhering to the shell. Eggs are sometimes removed from the shells and stored in bulk, usually on a commercial scale in cans containing about fifty pounds each. The temperature recommended is about 30° F., a little below freezing, and it is said they will keep any desired length of time. They must be used soon after they have been removed from storage and have been thawed. The substances suggested and the methods tried for excluding air conveying micro-organisms into the egg, and for killing those already present, are very numerous. An old domestic method is to pack the eggs in oats or bran. Another, which has always had many advocates, consists in covering the eggs with lime-water, which may or may not contain salt. The results obtained by such methods are not by any means uniform. Sometimes the eggs remain fresh and of good flavor, and at other times they spoil. A method of preserving eggs, which has recently been often used with much success, consists in packing them in carefully cleaned vessels of suitable shape, and covering them with a 10 per cent. solution of water-glass (sodium silicate or potassium silicate). The shells of eggs preserved in water-glass are apt to crack in boiling, but, it is stated, this may be prevented by puncturing the blunt end of the egg with a pin before putting it into the water. In the East Indian Archipelago salted ducks' eggs are an article of diet, the new-laid eggs having been packed for two or three weeks in a mixture of clay, brick-dust, and salt. They are eaten hard-boiled. In that region and in India, turtle-eggs are also preserved in salt. These products, while unusual, do not necessarily suggest an unpleasant article of diet. The same can hardly be said of a Chinese product which has often been described. Ducks' eggs are buried in the ground for ten or twelve months, and undergo a peculiar fermentation. The hydrogen sulphide formed breaks the shell and escapes, while the egg becomes hard in texture. The final product, it is said, does not possess a disagreeable odor or taste.

Diseases Caused by Egg-Eating. Some persons are habitually made ill by eating eggs, just as there are those who cannot eat strawberries or other food without distress. Such cases are due to some personal idiosyncrasy. Over-indulgence in eggs, as is the case with other foods, may induce indigestion or other bad effects. Furthermore, under certain conditions, eggs may be the cause of illness by communicating some bacterial disease or some parasite. It is possible for an egg to become infected with micro-organisms before it is laid, as well as after. The shell is porous, and offers no greater resistance to micro-organisms which cause disease than it does to those which cause the egg to spoil. If the infected egg be eaten raw, the micro-organisms present may gain entrance to the tissues and cause disease. Judged by the comparatively small number of cases of infection or poisoning due to eggs reported in medical literature, the danger of disease from this source is not very great. However, in view of its possibility, it is best to keep eggs as clean as possible, to reject or thoroughly cook doubtful ones, and thus endeavor to prevent infection.

Commercial Importance. The egg industry is of considerable commercial importance. The total number of eggs produced in the United States in 1899 was estimated to be 1,294,000,000 dozen, or 17 dozen per capita of the population. The United States formerly imported a large number of eggs, and exported very few. The ratio has recently changed, and now the exports largely exceed the imports.

Egg Powders, Desiccated Eggs, and Egg Substitutes. Several methods of evaporating or desiccating eggs have been proposed, and products which claim to be prepared in these ways are now on the market. The egg is dried in or out of a vacuum, usually by a gentle heat or by currents of air. Before being placed on the market, the material is usually ground. Sometimes salt and sugar are used as preservatives. As will be seen by reference to the above table of composition, such products are merely eggs from which the bulk of water has been removed. If the process of manufacture be such that the resulting product is palatable and keeps well, the value of evaporated eggs for many purposes is evident. This material is used by bakers, to some extent, as being cheaper, when fresh eggs are high in price. Since, if all the water be removed in preparing evaporated eggs, one pound of the dried product will furnish material equivalent to about four pounds of fresh eggs, and since desiccated foods have the advantage over the fresh substances of reduced bulk, evaporated eggs are used in provisioning camps and expeditions.

Egg substitutes have been devised which consist of mixtures of animal or vegetable fats, albumen, starch or flour, coloring matter, and some leavening powder in addition to the mineral matters similar to those found in the egg. Such products are designed to resemble eggs in composition. One has been manufactured from skim-milk containing the casein and albumen of the milk, mixed with a little flour. It is put up in the form of a paste or powder. Other egg substitutes have been marketed which contain little or no albumen, but which apparently consist quite largely of starch, more or less colored, with some yellow substance. These goods, sometimes called 'pudding' or 'custard powder,' are specially recommended for making custards and puddings similar in appearance to those in which fresh eggs are used. There is no reason to suppose that such products cannot be made so that they will be wholesome and perfectly harmless; but the fact must not be overlooked that in the diet they cannot replace fresh eggs, since they do not contain much nitrogenous matter or fat. This may be an important matter if such an egg substitute be used in the diet of invalids, especially if the composition of the egg substitute is not known, and it be employed with the belief that, like eggs, it contains an abundance of protein.

EGG, Augustus Leopold (1816-63). An English artist, born in London. He became a painter of genre pictures, and, like Leslie and Newton, chose his subjects from literature and history. His pictures show a greater feeling for color than Leslie's, but are without his humor, and in a scene from "Le Diable Boiteux" (1844, National Gallery) he shows an execution far superior to Newton's. The influence of the Pre-Raphaelites is traced in "Pepys's Introduction to Nell Gwynne" (1851). Among other noteworthy paintings are "Peter the Great Sees Catherine for the First Time" (1860); "The Night Before Naseby" (1859); and "Katherine and Petruchio" (1860). In 1860 Egg became a Royal Academician.

EGG, or **EIGG**. An island of the Inner Hebrides (q.v.) group, 12 miles off the west coast of Inverness-shire, Scotland, and eight miles southwest of Skye (Map: Scotland, B 3). It is about six and one-half miles long, and terminates on the southwest in the remarkable Scuir of Egg, which rises to 1346 feet. The upper 470 feet of this hill is a mass or vein of pitchstone. Some of the pitchstone forms straight, inclined, or curved columns, which vary in diameter from a few inches to nearly two feet. In the south part of the island is a large cave, entered by a narrow opening, through which but one person can creep at a time. Here, in the sixteenth century, a feudal laird of Macleod, to revenge an injury done to some of his clan, smoked to death all of the inhabitants (200 Macdonalds) of the island, who had hidden themselves in the cave. Population, 250.

EG'GA. A town of Nupe, in British Nigeria, West Africa, situated on the right bank of the Niger (Map: Africa, E 4). Its commerce is very important, and it has a considerable transient population. The inhabitants, who number about 25,000, are chiefly engaged in trade.

EGG-BIRD. Any wild bird whose eggs are regularly sought as food by mankind; especially, a gull or tern, and, in particular, the sooty tern. See Tern.

EGG COCKLE. The common edible cockle of Europe. See Cockle.

EGG DANCE. A very old English dance, which was probably derived from the Saxons. Eggs were placed at certain intervals on the floor, and the dancer took his position and was blindfolded. The music used was the hornpipe, and to it the performer danced back and forth between the eggs, without touching them. The positions of the eggs and the figures danced seem always to have been the same. A similar feat was very popular in Holland in the seventeenth century, and the Valencians in Spain have much the same sort of a dance at the present time.

EGG-EATING SNAKE. A remarkable little colubrine serpent (*Dasypeltis scabra*) of South Africa, whose dentition and throat are specially adapted to the consumption of birds' eggs, upon which this snake mainly subsists. It is a slender little creature, prettily variegated, and about two feet in length. Its mouth has no teeth, but has "about thirty of what may be termed throat teeth; these being the lower spines of the vertebræ, which project into the œsophagus, and are tipped with enamel." It lives in trees and feeds on the eggs of small birds; but, when pressed by hunger, will descend and rob hens' nests, and the elasticity of its mouth and throat is so great that it can take into them pigeons' eggs with ease and even large fowls' eggs. When the egg is fairly within the throat the throat teeth cut through the shell, allowing all its fluid contents to be swallowed without the loss of a drop, after which the crushed shell and membranes are ejected. An illustrated article upon examples living in the Zoölogical Gardens of London may be found in *The Field* (London, 1892).

AN EGG-EATING SNAKE.

Appearance of the snake (*Dasypeltis scabra*, with an unbroken egg in its gullet, showing the extensibility of jaws and throat.

EG'GELING, Julius (1842—). An English Sanskrit scholar. He was born at Hecklingen, Germany, and was educated at Breslau and Berlin (1862-66). Within a year after his graduation he went to England, where in 1869 he was appointed secretary and librarian of the Royal Asiatic Society. In 1872 he became professor of Sanskrit at University College, and three years afterwards was called in the same capacity to Edinburgh. His publications include: *The Çatapatha-Brāhmana, Translated According to the Text of the Mādhyandina School* (vols. i. and ii., 1882-85); *Catalogue of Buddhist Sanskrit Manuscripts in the Possession of the Royal Asiatic Society* (with Cowell, 1875); the article "Sanskirt Language and Literature," in the *Encyclopædia Britannica* (1887); *Catalogue of Sanskrit Manuscripts in the Library of the India Office* (2 parts, 1887 and 1889); and editions of *Vardhamāna's Gaṇaratnamahodadhi* (2 parts, 1879-80); the *Kātantra* (6 books, 1874-78); and of the *Kaṇva Śatapatha Brāhmaṇa* (1902).

EGGER, ā'gâr', Emile (1813-85). A French classical scholar, born in Paris. After holding various professorships of ancient languages, he was professor of Greek literature at the Faculté des Lettres from 1855 to 1884. Among his best-known works are: *La poétique d'Aristote* (1850), probably his most interesting work; *Notions élémentaires de grammaire comparée* (1852); *Mémoires d'histoire ancienne et de philologie* (1863); and his masterpiece, *L'hellénisme en France* (1869), dealing with the influence of the Greek upon the French language. He was a frequent contributor to the *Mémoires de l'Académie des Inscriptions;* the *Journal de l'Instruction Publique; Revue des Deux Mondes,* and to the *Journal des Savants,* of which he became editor in 1871. He was a member of the Academy of Inscriptions and an officer of the Legion of Honor. Consult Bailly, *Notice sur Emile Egger* (Paris, 1886).

EGGER-MOTH. A bombycid moth of either the genus Lasiocampa or Eriogaster. The name is chiefly in use among British lepidopterists, and is often spelled *eggar.*

EG'GERS, Jakob, Baron (1704-73). A Swedish soldier and military author, born at Dorpat, Livonia. At an early age he entered the service of Sweden, and devoted himself to the study of the science of fortification. He subsequently served in Poland, Hesse, and Saxony, and upon his return to Sweden, in 1742, was appointed quartermaster-general and adjutant to the King, in which capacity he served in the campaign against Russia in 1742-43. His description of the siege of Bergen-op-Zoom, *Journal du siège de Bergopzoom* (1750), which he witnessed as a volunteer in the French army, is a vivid portrayal of that engagement. In 1751 he published an improved edition of Desbois's *Dictionnaire militaire,* which was followed in 1757 by an independent work, entitled *Neues Kriegs-, Ingenieur-, Artillerie-, See- und Ritter-Lexikon,* a long and authoritative work on the subject.

EGGFISH (so called from the shape when inflated). A globefish, especially *Tetrodon turgidus.* See Globefish.

EG'GLESTON, Edward (1837-1902). An American novelist and historian. He was born at Vevay, Ind., December 10, 1837, the son of a lawyer. Of delicate health in childhood, and largely self-educated, he began life as a Methodist circuit-rider, and was then agent in Minnesota for the Bible Society, doing such pastoral work as his health permitted, and engaging in other pursuits as opportunity offered. In 1866 he went to Evanston, Ill., and for a time edited a children's paper. In 1867 he removed to Chicago and edited *The Sunday School Teacher,* gaining national reputation as manager of Sunday-school teachers' institutes, and as a speaker at Sunday-school conventions. Meanwhile he contributed with increasing frequency to the New York *Independent,* in 1870 became its literary editor, and soon afterwards superintending editor, a post that he resigned to become editor of *Hearth and Home,* which again he gave up for a Brooklyn pastorate (1874-79); finally retiring to a country place on Lake George and devoting himself to literature. He had already made southern Indiana peculiarly his own in fiction by his racy *Hoosier Schoolmaster* (1871), a great success, appearing first in *Hearth and Home.* He followed this up with other novels, some of them quite popular: *The*

End of the World (1872); *Mystery of Metropolisville* (1873); *The Circuit Rider* (1874); *Roxy* (1878). He now began, with the help of his daughter, Mrs. Lillie E. Seelye, the publication of juvenile biographies of American Indians: *Tecumseh* (1878); *Pocahontas and Powhatan* (1879); *Brant and Red Jacket* (1879); *Montezuma* (1880). In 1883 he returned to Indiana fiction in *The Hoosier School Boy*, continuing with *The Graysons* (1888), *The Faith Doctor* (1891), *Duffels* (1893). His biographical studies led him to a wider study of American history, in which he was mainly interested during his last years. Among his works in this field are *A Household History of the United States* (1888), and a series of volumes on the development of American society, *The Beginners of a Nation* (1896), and *The Transit of Civilization* (1900)—which are marked by a very minute knowledge of Colonial life and thought, and with their attractive style are among the best of recent American histories, in spite of a certain want of sympathy with the mental attitude of the epochs described.

EGGLESTON, George Cary (1839—). An American editor, novelist, and miscellaneous writer, brother of Edward Eggleston. He was born at Vevay, Ind., and was educated at Asbury University, Ind., and Richmond College, Va. He studied law, practiced, and served in the Confederate Army throughout the Civil War. In metropolitan journalism he served as managing editor of *Hearth and Home* (1871-74); editor of *American Homes* (1874-75); literary editor of the New York *Evening Post* (1875-81); literary editor of the *Commercial Advertiser* (1884), later its editor-in-chief (1886-89), and finally a member of the staff of *The World*. He wrote *A Rebel's Recollections* (1874), and also numerous books for the young. More important are such novels as *Southern Soldier Stories* (1890); *The Last of the Flatboats* (1900); *A Carolina Cavalier* (1901); *Dorothy South* (1902); *A Daughter of the South* (1905); *Life in the 18th Century* (1905); *Our First Century* (1905).

EGGPLANT (*Solanum melongena*). A plant, native of the tropics, usually less than two feet high, with stem partially woody; the fruit resembles an egg in shape, and varies from the size of a hen's egg to six or even eight inches in diameter, in color generally violet, white, or yellow. The fruit is much used as a vegetable in warm countries, especially in the East Indies. It is successfully grown in the northern portion of the United States when started in a hotbed. The white-fruited varieties are said to be most popular in Europe, but in America the black and purple varieties are most in favor. The early dwarf purple is an especially good variety for the Northern States. The New York purple and black Pekin are excellent shipping varieties. The plant grows well in the South on almost any good soil, and gives better results with commercial fertilizers than with fresh barnyard manure.

Eggplant Diseases. The diseases to which the eggplant is subject are neither numerous nor very destructive, although at times they become epidemic, scarcely a plant escaping. The anthracnose (*Glæosporium melongena*) attacks the fruits, producing small sunken areas which contain minute pink blotches. A mold (*Botrytis fascicularis*) attacks the fruit, causing a rapid softening in spots, accompanied with a gray mold on the surface. A leaf-spot due to the fungus *Phyllosticta hortorum* attacks the leaves, causing the tissues to turn brown, dry up, and fall away, leaving ragged holes. The fruit may also be attacked by this fungus, after which soft, sunken patches appear. The disease spreads until the entire fruit is a rotten mass. All these diseases may be checked in their spread by the use of any of the standard fungicides; e.g., Bordeaux mixture. A bacterial disease caused by *Bacillus solanacearum* is sometimes very destructive. For illustration see Plate of Garden Vegetables.

EGGSHELL CHINA. A very thin and translucent variety of china, originally made in China, but now produced in European factories.

EGG-TOOTH. A hard, sharp prominence on the tip of the beak or nose of embryo birds and egg-born reptiles, enabling them to break through the egg-shell at hatching time without injury to the organ. It is described by Newton as composed of calcareous matter, not connected with the underlying bone, deposited in the middle layer of the epidermis of the tip of the upper mandible (of birds). In both birds and reptiles it peels off and is dropped soon after the hatching. An analogous arrangement appears in the great jaws of certain insects, used only for freeing themselves from their cocoons; and Darwin, *Origin of Species* (London, 1882), bases an argument for his theory of natural selection upon the existence of such temporary structures, serving a highly important service only once in an animal's lifetime, pointing out that a small superiority of equipment in this respect might alone save the life of the animal at the critical moment of its attempting to escape from the egg, and that those best endowed would be most likely to survive and perpetuate this useful feature.

EGHAM, ĕg'am. A village in the northwest of Surrey, England, on the right bank of the Thames, 18 miles west of London (Map: England, F 5). In the vicinity are Runnymede (q.v.) and Cooper's Hill, rendered famous by Denham and Pope.

EGIDY, â-gē'dē, Moritz von (1847-98). A German soldier and writer on ethical topics. He was born at Mainz, entered a Brandenburg regiment as lieutenant in 1865, and a cavalry regiment of the army of Saxony in 1868. He attained the rank of lieutenant-colonel in 1889, and in 1890 retired from the service. His pamphlet, *Ernste Gedanken* (1890), was widely circulated, aroused much discussion and comment, and was the basis of the so-called "Egidy Bewegung" (movement), which in a rather ill-defined way sought to effect a non-sectarian and undogmatic Christianity. *Weiteres zu den Ernsten Gedanken* (1890) and *Ausbau der Ernsten Gedanken* (1891) were supplementary, and in 1892 a quarterly, *Einiges Christentum*, appeared at Kiel (from 1899 at Berlin as a bi-monthly with the title *Ernstes Wollen*). Consult Driesmans and Mülberger, *Moritz von Egidy, sein Leben und Wirken* (Dresden, 2 vols., 1900).

EG'ILL SKALLAGRIMSSON (c.900-c.980). An Icelandic skald. His parents were among those who were forced to emigrate after Harold Fairhair's victory at Hafrs Fjord. Egill entered the service of the English King Athelstan in 925, and fought under him for several years.

He returned to Norway after Harold's death and revenged himself upon his successor, Erik Bloodaxe, by killing his son in 934. Afterwards he was taken prisoner by Erik, and only regained his liberty by composing a number of stanzas praising that king. This poem, which was called *Höfudhlausn* (the Redemption of the Head), was partly translated into Swedish by Sörenssen (1866). His greatest saga, *Sonartorrek*, was composed on the death of his favorite son. It is full of the bitterest grief and an unquenchable pride. He also composed a saga to celebrate his friend Arinbjörn, the *Arinbjarnar drápa* (975), translated into Swedish by Björlin in 1864, and the *Skjaldar drápa* (970). The famous Icelandic poem called "Egill's Saga," which some critics suppose to be by Snorri Sturluson, is a glowing description of Egill's career, and contains several of his own songs. Consult Jonsson's edition of this saga (Copenhagen, 1886-88, and Halle, 1894).

EGILSSON, ā'gil-sôn, SVEINBJÖRN (1791-1852). An Icelandic philologist, born in Iceland. After completing a course of study at the University of Copenhagen he returned to Iceland. For several years he was rector of the Latin school at Reykjavík. He retired in 1851. Egilsson is best known by his dictionary of Old Norse poetry (*Lexicon Poeticum Antiquæ Linguæ Septentrionalis*, 1860). He also published a number of articles on Old Norse.

EGINHARD, ĕg'ĭn-härd. See EINHARD.

EG'LAMORE, Sir. One of the Knights of the Round Table, and the hero of a popular ballad which tells of his slaying a terrible dragon.

EG'LANTINE (Fr. *églantine*, from OF. *aiglant*, *aiglent*, Port. *aguilen*, sweetbrier, from Lat. *aculeus*, thorn, from *acus*, needle). A name given to two species of rose, and sometimes, erroneously, to honeysuckle. The first species, *Rosa rubiginosa*, is a dense shrub, often six feet tall, the stems of which bear hooked prickles, dark-green leaves, and, in June, bright-pink short-stemmed sweet-scented flowers, followed by orange-red or scarlet fruits. It is a native of Europe, but has become naturalized in many parts of the Eastern United States and Canada. Some of its cultivated double forms and some of its hybrids with other species of rose are very attractive. The second species, *Rosa eglanteria*, is a West Asian shrub with long climbing stems, bearing straight prickles, dark-green leaves, and, in June, yellow flowers, which have an offensive odor.

EGLANTINE, ā'glȧn-tēn', MADAME. The prioress of Chaucer's *Canterbury Tales*.

EGLESTON, THOMAS (1832-1900). An American mineralogist and metallurgist, born in New York City. He was educated at Yale and the Ecole des Mines in Paris. In 1861 he was placed in charge of the mineral collections of the Smithsonian Institution. In 1863 he submitted a plan for a school of mines in New York City to the trustees of Columbia College, and in 1864 the school was opened with Egleston as professor of mineralogy and metallurgy. This was the first American institution for practical instruction in mining and metallurgy. His publications include: *Tables for the Determination of Minerals* (1867); *Lectures on Mineralogy* (1871); *The Metallurgy of Gold, Silver and Mercury in the United States* (1887).

EGLI, ā'glē, JOHANN JAKOB (1825-96). A Swiss geographer. He was born at Uhwiesen-Laufen in the Canton of Zurich, and after teaching at various schools was in 1883 appointed professor of geography at the University of Zurich. He may be said to have been the founder of the science of geographical nomenclature. His principal work, which is devoted to this subject, is entitled: *Nomina Geographica, Versuch einer allgemeinen geographischen Onomatologie* (2d ed., 1893); *Geschichte der geographischen Namenkunde* (1886). Among his other works are: *Neue Erdkunde* (8th ed., 1894); *Neue Handelsgeographie* (5th ed., 1892), and *Der Völkergeist in den geographischen Namen* (1894).

EG'LINTON AND WINTON, ARCHIBALD WILLIAM MONTGOMERIE, Earl of (1812-61). An English politician. He was born in Palermo, Sicily, was educated at Eton, and succeeded his grandfather as Earl of Eglinton in 1819. He was an enthusiastic sportsman, and won the Derby with Flying Dutchman in 1849. In 1839 he carried out the celebrated tournament at Eglinton Castle, Ayrshire, described by Disraeli in *Endymion*. He was Lord Lieutenant of Ireland in 1852 and again in 1858-59, and while holding this position attracted attention by the magnificence of his official entertainments. He became Earl of Winton in the peerage of the United Kingdom in 1859.

EG'LON. (1) A king in Moab, who, according to Judges iii. 12-30, oppressed Israel for eighteen years, and was assassinated by the Benjaminite Ehud (q.v.). (2) An Amorite city mentioned in Joshua x. 36, xii. 12, xv. 39. Its king, Debir, is represented as joining the league against Joshua that was led by Adonizedek (q.v.). The city was evidently not far from Lachish. It has been identified with the modern Khirbet Ajlan, two miles north of Tell el Hesy, and with Tell Nejileh, three miles south of this place.

EG'MONT. A tragedy by Goethe, published in 1788. Its plot centres about the revolution in the Netherlands in the middle of the sixteenth century.

EG'MONT, JOOST VAN (1601-74). A Dutch painter, born at Leyden. He was a pupil of Caspar van den Hoecke, and afterwards studied under Rubens. He became Court painter to Louis XIII. and Louis XIV., and was one of the first twelve members of the Académie Royale de Peinture, founded in 1648. His works are rare, and all details of his life are uncertain. He is often confounded with his father, also named Joost, and with other insignificant painters of the same name. There are portraits of Philip IV. of Spain and of the Archduke Leopold Wilhelm at Vienna by him, and portraits of Louis XIV. and Maria Theresa at The Hague.

EGMONT, or **EGMOND**, LAMORAL, Count, Prince of Gavre (1522-68). A Flemish general and statesman, born at the Castle of La Hamaide, in Hainaut. He succeeded his elder brother Charles in the title and estates in 1541, accompanied Charles V. on the Algerian expedition in the same year, and followed that monarch afterwards in all his campaigns against Francis I. His bravery and devotion were rewarded in 1546 with the order of the Golden Fleece. The year previous he had married Sabina of Bavaria, the sister of the Elector Palatine, with great pomp in the presence of the Emperor at Speyer. In 1554 Egmont was sent to England to negotiate the marriage between Mary and Philip. After the accession of Philip II. he commanded the cavalry in the battles of Saint Quentin and Gravelines (qq.v.); and when Philip finally returned to Spain he left Egmont as Stadtholder of Flanders and Artois. When Margaret of Parma, against the will of the Protestant party, was made Regent-General of the Netherlands, Egmont and the Prince of Orange entered the Council of State, and opposed the ultra-Catholic policy of Cardinal Granvella and the Regent. On Egmont's threatening to resign, Granvella was withdrawn from the Low Countries, and in 1565 the Count visited Philip at Madrid and departed homeward full of confidence in the King. But the reactionary edicts of Granvella were ordered to be enforced with more severity than ever, and the people were roused to rebel. When the insurrection broke out Egmont opposed the Prince of Orange and the 'Beggars' League,' as it was called. He seems to have remained neutral even when, in April, 1567, his bitter enemy and rival, the Duke of Alva, was sent as lieutenant-general to the Netherlands. (See ALVA.) The Prince of Orange and other chiefs of the insurrection left the country, while Egmont, wishing to save his private property, remained, thinking his loyalty and services had secured his safety. He appeared to have gained Alva's confidence, when suddenly, after a sitting of the council, he and Count Horn were seized and carried to the citadel of Ghent. The Estates of Brabant sought to withdraw them from the Bloody Tribunal, as it was called, instituted by Alva, and Egmont, as a knight of the Golden Fleece, denied its competency. His countess pleaded earnestly in his behalf, and intercession from the highest quarters was made to Philip. At his trial he was accused of having favored the enemies of the Catholic religion and of plotting the overthrow of the King. Ninety charges were brought against him, which he did not trouble himself to answer in detail, but protested his innocence, and showed clearly that he had been a loyal subject and faithful counselor of the King. Nevertheless, he was condemned to death by Alva and his tools, and on June 5, 1568, was executed in the great square of Brussels at the same time as Count Horn. Their death made them martyrs to the cause of liberty in the Netherlands, and in 1865 a monument by Fraikin was erected to their memory at Brussels. Goethe has made Egmont the hero of one of his finest tragedies. One of the best brief accounts of Egmont is given by Schiller in his *Abfall der Niederlande.* Consult: Motley, *Rise of the Dutch Republic* (London, 1861); Juste, *Le comte d'Egmont et le comte de Hornes* (Brussels, 1862); De Bavay, *Procès du comte d'Egmont et pièces justificatives* (Brussels, 1853); also the published correspondence of Philip II. and of Margaret of Parma.

E′GO (Lat., I). A term much used by philosophers to denote the conscious self or person, especially when conceived as the metaphysical subject whose activity is supposed to give rise to the world of experience.

E′GOISM. A term formerly sometimes applied in philosophy to any view that was supposed to make the individual self the only reality knowable. It is now used almost entirely in an ethical sense as an antonym to altruism (q.v.). It denotes either the set purpose to make one's own private welfare the sole end of one's endeavor, or the theory of morals which asserts that such an end is the only one reasonable or possible.

E′GRET (Fr. *aigrette*, diminutive of dialectic *égron*, OF. *hiron*, Fr. *héron*, heron). A name often given to various species of heron (q.v.), particularly those of white plumage which, at least during the breeding season, have the feathers on the lower part of the back lengthened and their barbs loose, so that this part of the plumage is very soft and flowing. These plumes are used for ornamental purposes. (See AIGRET.) In old English bills of fare egrets are mentioned as if they were abundant; and not fewer than 1000 'egrittes' are included in the bill of fare of a single great feast, given at the enthronization of George Neville, Archbishop of York, in the reign of Edward IV.; but these were really, no doubt, lapwings. Two species of egret are known in Europe—a large one (*Ardea alba*) and a small one (*Ardea garzetta*). In the southern United States three species of heron are known as egrets, the American egret (*Ardea egretta*), the snowy egret (*Ardea candidissima*), and the reddish egret (*Ardea rufescens*). All three were formerly abundant to a remarkable degree in Florida, but are now rare, owing to persistent destruction of them in the breeding season, for the sake of their plumes. Few chapters in American ornithology are so sad as the story of the slaughter of Florida's herons to supply the demands of an inexcusable and barbarous fashion. The reddish egret is of special interest because it illustrates the curious phenomenon known as *dichromatism*, some of the birds being pure white, while others are dark bluish slate color, and this difference does not seem to be connected with age, sex, or season. See DICHROMATISM; HERON, and Plate of WADING BIRDS.

EGUISHEIM, ā′gĭs-hĭm. An archæological station near Colmar, Alsace. In digging a beer-cave, fragments of a human skull comprising a frontal and parietal bone were unearthed at a depth of about eight feet. The skull resembles the Neanderthal type, but the forehead is larger and the orbital arches less prominent. Consult Mortillet, *Le préhistorique* (Paris, 1900).

EGUSQUIZA, ā′gōōs-kē′sȧ, JUAN BAUTISTA (1845—). A South American politician, and a President of Paraguay, born in Asunción. In the war against Brazil, Argentina, and Uruguay, he rose to be a lieutenant-colonel. Subsequently he became Secretary of War and general. In 1894, following upon the summary deportation to Buenos Ayres of President Gonzalez, he was elected President of the Republic for the term ending in 1898. His administration was in the main peaceful and progressive.

EGYPT. A country occupying the northeast corner of Africa. Egypt proper extends from the Mediterranean south to the latitude of 22° N. (For an account of the agreement between the British and Egyptian governments, January 19, 1899, see EGYPTIAN SUDAN.) The boundary on the east is the Red Sea, and on the extreme northeast Syria. The western boundary, fixed by the firman of 1841, starting from the Mediterranean at about the 25th meridian of east longitude, runs southwest to the southeast corner of Tripoli, and thence southeast to a point about 200 miles west of Wadi Halfa. In addition, the oasis regions in the eastern third of the Libyan Desert belong to Egypt. The northernmost point of the country is in latitude 31° 40′ N. Egypt thus extends 675 miles north and south, with a general breadth of about 500 miles. Its area is about 400,000 square miles, but the cultivated region in the Nile Valley and Delta includes only about 10,000 square miles, about 9,000,000 people being crowded into a space about as large as the area of New Hampshire. The vast region called the Egyptian Sudan, extending southward from Egypt into equatorial Africa, is governed by Great Britain and Egypt jointly.

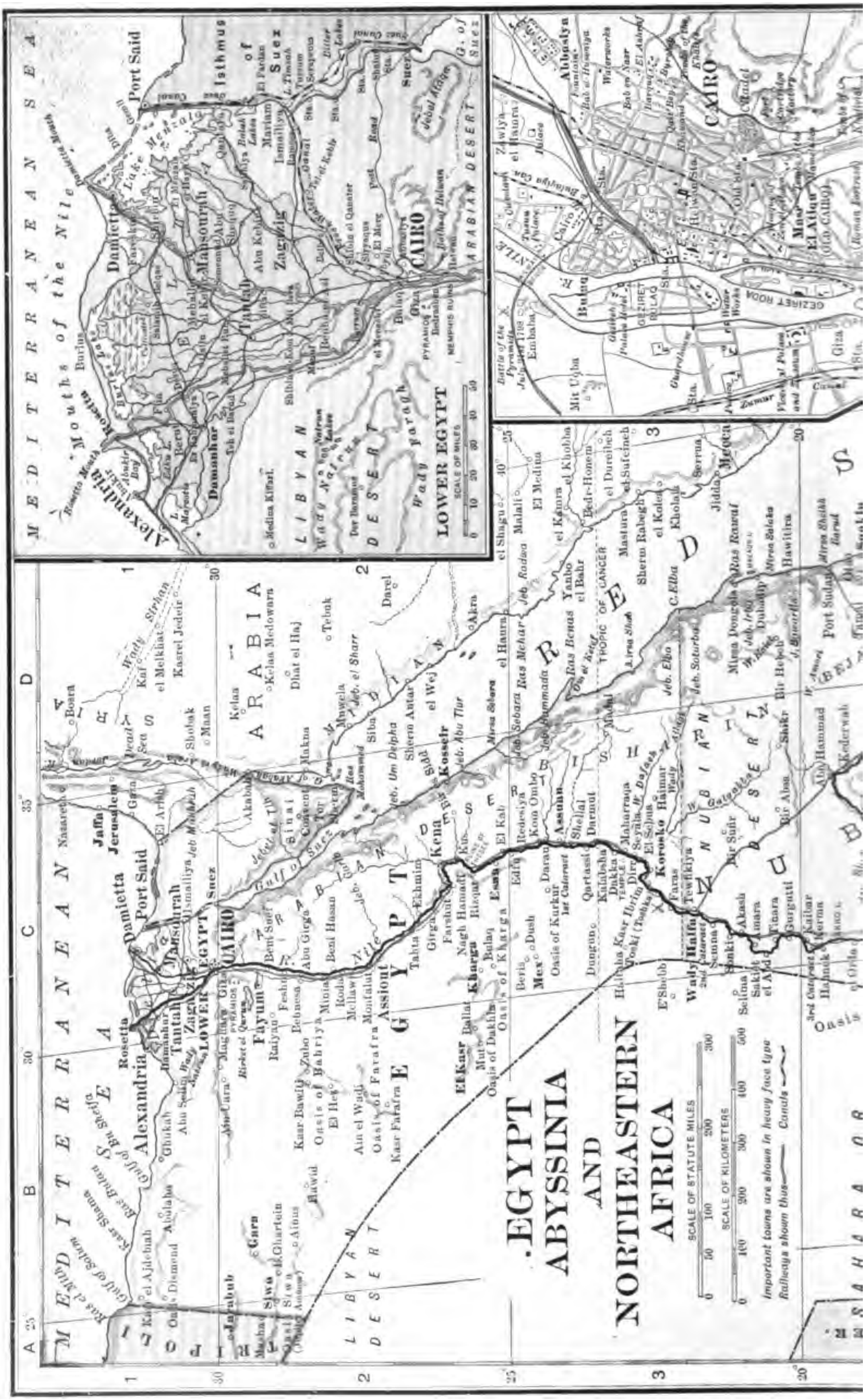
TOPOGRAPHY. Egypt is a part of the great desert zone of North Africa, most of it being comparatively level sand waste, varying in elevation from 600 to 1600 feet above the sea. Four natural features distinguish parts of the country from the expanses of sand that stretch away in all directions. To the west of the Nile, in the barren wastes of the Libyan Desert, are many little regions of depression where the surface is below sea-level, or only a few hundred feet above it. Oases occur in these regions, deriving their water by infiltration from the Nile or from other sources of subterranean supply. The desert conditions of this part of the Sahara are more pronounced than in any other region of the world; but a considerable population inhabit the oases, and Jof, in the Kufra group, was the home of the Senussi Mahdi, whose followers, in various parts of Africa and Asia, number some millions of Mohammedans. (See MOHAMMEDANISM, SENUSSI.) The second distinctive feature lies to the east of the Nile—a district of mountains. The roughly oblong piece of country between the Nile and the Red Sea, with Cairo and Suez as its northern, and Assuan and Berenice as its southern corners, is a mountainous desert, 150 miles broad, rising gradually from the Nile over sandy wastes and hills of secondary formation for 100 miles, where the elevation is about 2000 feet. Down the centre runs a main ridge or backbone of granite or primary rocks, from which the desert slopes more steeply and evenly to the sea. Clouds hang around the tops of these mountains in winter and there is sufficient precipitation to provide water and herbage for the scanty flocks of the Bedouins. Along the Red Sea is a line of jagged mountains whose highest summit is about 7000 feet. The third distinctive feature lies south of Assuan—a region of desert hills and of pitiless sand plains, the northern part of the Nubian Desert. This district is bordered on the west by the Nile with its thin fringe of vegetation. The fourth distinctive feature is the valley of the Nile.

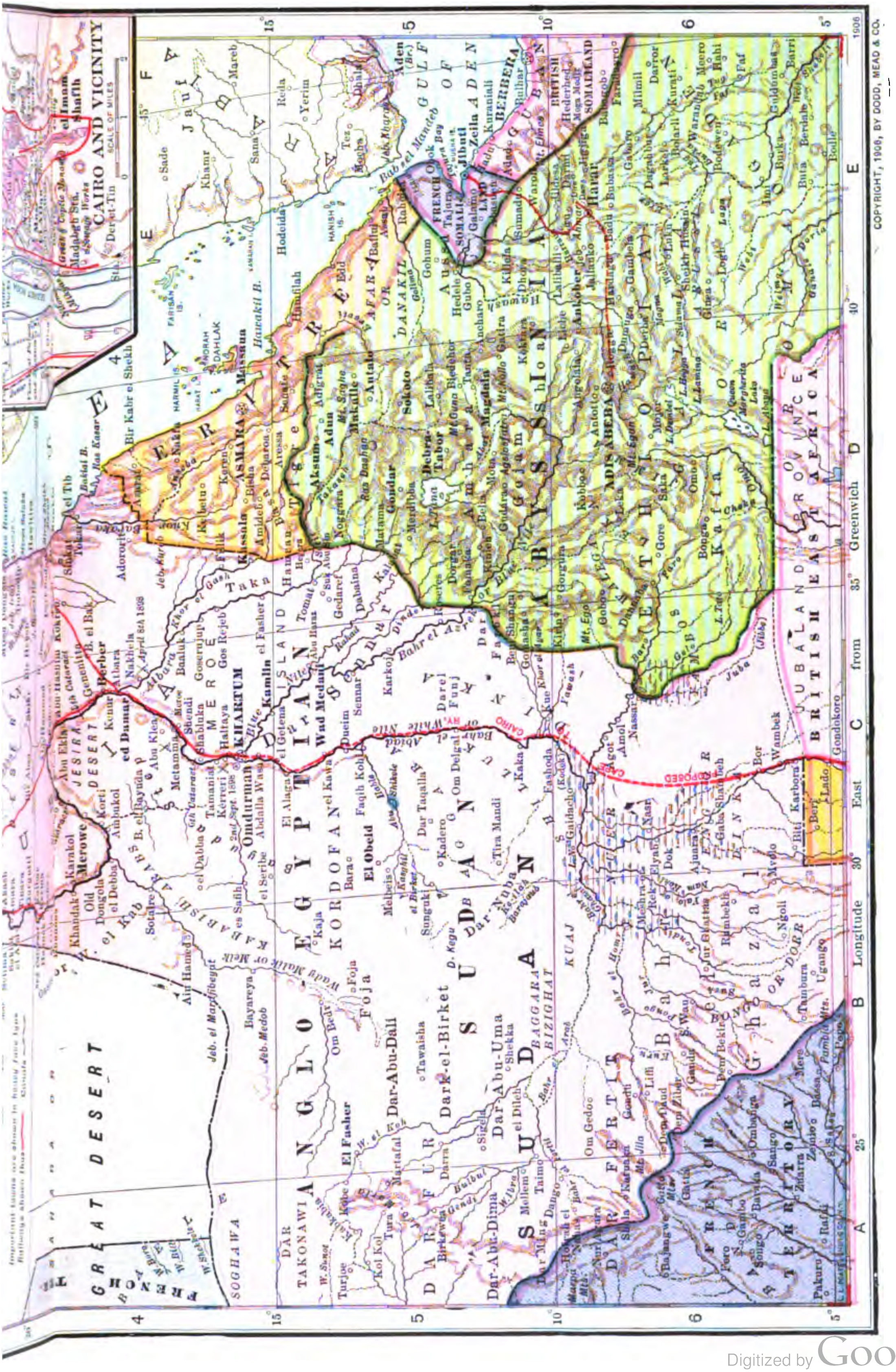
The First Cataract, the only one in Egypt, is just south of Assuan. The course of the Nile from the southern boundary of Egypt to the sea is about 800 miles. The Lower Nile, from Assuan to Cairo at the head of the Delta, is much visited by tourists. This riverain region, fertilized by flood waters and irrigation canals for an average breadth of nine miles, yields large crops. The Delta, from Cairo to the Mediterranean, covered with a network of navigable streams and irrigation canals, is the garden of Egypt. Most of the population and agricultural interests are grouped here, with Cairo, the political and administrative centre, on one side, and Alexandria, the chief port and commercial centre, on the other. On the west side of the Nile, southwest of Cairo, is the depressed valley of Fayum, a fertile tract, in the northern part of which is the lake called Birket-el-Kerun.

CLIMATE. In the southern part of Egypt there is considerable rainfall; over a large part of Lower Egypt there is practially no rain. On the immediate shores of the Mediterranean, however, there is some precipitation, owing to proximity to the sea. Thus at Alexandria, on the coast, the rainfall is on the average 8 inches, while at Cairo at the head of the Delta, it is but 1½ inches. There are also great differences in temperature. Near the sea, where its influences are felt, the temperature rarely reaches the freezing-point, while sometimes during the prevalence of the land-wind from the south, the "Khamsin," it has been known to reach 114°. In the part of Lower Egypt where desert conditions prevail, great contrasts of temperature are observed. Throughout Lower Egypt the air is extremely dry, and the sky clear, the average annual cloudiness being not over 20 per cent. The winds blow from the north and northwest during the fall and winter, but in the spring and summer are often from the south. The hot south Khamsin blows chiefly during April and May. There are practically three seasons in the Nile valley: The period of inundation or flood from the middle of June to the middle of November; the so-called springtime, when seeds are planted and crops grow, the period from November to March; and the summer time, from March to June.

FLORA. The date-palm and sycamore are the chief trees of Egypt, but all the tropical fruits which flourish in a dry climate are found. Among these are lemons, oranges, and figs. Tamarisks and thorny acacias occur in the less dry deserts. Many species of trees have been introduced, and where they can obtain sufficient moisture they thrive well. Clover, grains, and cotton are extensively grown in the watered region, and in the Delta region rice and sugarcane. Tobacco might be a large crop, but its cultivation has been prohibited since 1890. Durra, the almost extinct papyrus, and the lotus are characteristic Egyptian plants.

FAUNA. Considered with respect to its animals, Egypt is essentially a part of Europe, and not at all Ethiopian. It is, in fact, like the whole south shore of the Mediterranean, classed as a part of the Palearctic Province. (See DISTRIBUTION OF ANIMALS.) Perhaps no equally extensive part of the world has witnessed so great a change in its fauna as has occurred in the lower valley of the Nile during the 6000 years that it has been the seat of historical human occupation. Originally, no doubt, a large area, if not the whole breadth of the country on both sides of the Nile, was clothed with forests, which sustained a great variety of animals that disappeared with the destruction of the trees; and, on the other hand, some of the most characteristic of the animals of modern Egypt have become so only through man's occupation. Anciently, many of the animals of the tropical Nile followed the river down to its Delta, including the elephant and hippopotamus. Crocodiles abounded within historic times, but have long been absent below the cataracts of the Nile. The river still furnishes a great variety of fish, few of which, however, are desirable for the table. Among them is the strange ganoid bichir (q.v.). Many varieties


EGYPT ABYSSINIA AND NORTHEASTERN AFRICA
SCALE OF STATUTE MILES
SCALE OF KILOMETERS
Important towns are shown in heavy face type
Railways shown thus
Canals
LOWER EGYPT
SCALE OF MILES
CAIRO
MEDITERRANEAN SEA
Mouths of the Nile
Isthmus of Suez
LIBYAN DESERT
ARABIAN DESERT
Alexandria
Rosetta
Damietta
Port Said
Mansourah
Tantah
Zagazig
Suez
Jaffa
Jerusalem
ARABIA
EGYPT
Fayum
Assiout
Kena
Kosseir
Assuan
Korosko
Wady Halfa
Siwa
Jarabub
NUBIAN DESERT
TROPIC OF CANCER
Mecca
Jidda
Port Sudan
Sinai
Gulf of Suez
Red Sea
Nile


CAIRO AND VICINITY
GREAT DESERT
ANGLO EGYPTIAN SUDAN
KORDOFAN
DAR FUR
ERITREA
ABYSSINIA
FRENCH SOMALI
BRITISH SOMALILAND
GULF OF ADEN
FRENCH TERRITORY
JUBALAND PROVINCE
BRITISH EAST AFRICA
KHARTUM
Longitude East from Greenwich
COPYRIGHT, 1906, BY DODD, MEAD & CO.

of water-fowl and wading birds, mainly the same as, or closely related to, European forms, move with the seasons up and down the river. Birds of prey are especially frequent in Egypt, where kites abound in the towns and do an important service toward keeping them clean. In winter, hosts of familiar European birds are present. Several species of antelope, now becoming rare, such as the addax and oryx, approach the Nile from the Sahara. The wild ass is still to be seen in the remoter southern parts. Snakes are common, among them the deadly asp. The desert supports jackals and foxes (fennecs), and packs of striped hyenas haunt the caravan trails and neighborhood of rural villages. Lions are no longer to be seen except on the borders of the Sudan or in the rough mountains along the Red Sea near Abyssinia. Leopards are somewhat more numerous. Among the domesticated animals is the ichneumon.

Geology and Mineral Resources. Egypt has no geological features distinct from those common to the rest of Africa. The fundamental igneous and metamorphic rocks which underlie the horizontal strata of the Sahara and the Sudan, extend across the Nile into the Arabian Desert, and are prominent in the range of mountains lying along the western shore of the Red Sea. These rocks in many places support a sedimentary cap called the "Nubian Sandstone," a formation that also appears in various localities on both banks of the Nile. In Lower Egypt Cretaceous and Tertiary limestones are extensively developed. The quarries of Egypt in ancient times produced great quantities of granite, porphyry, sandstone, and limestone, suitable both for building and for sculptural purposes; but they are now worked only intermittently. In other respects the mineral resources of the country are limited. The salt marshes of the Delta produce salt, soda, and alum, and some saltpetre is manufactured. The gold-mines, which, according to ancient records, were worked as early as 2500 B.C., have been rediscovered in the crystalline rocks of the rugged mountains east of the Nile where abundant evidences of the old workings are found. Most of the auriferous quartz veins are found in the lower ranges. British engineers who are exploring this region have reported favorably (1901) on the prospects of profitable gold-mining.

Agriculture. Egypt is essentially an agricultural country, two-thirds of the inhabitants with declared occupations being engaged in farming. But Egypt differs widely in this respect from most other countries by reason of its dependence on the annual overflow of the Nile or artificial irrigation, for the raising of crops. (For a description of this river and its floods, see Nile.) Since the British occupation in 1882, great progress has been made toward the full utilization of the annual overflow, by the construction or improvement of huge dams, particularly the Barrage at the head of the Delta, which raises the level of the river and permits the perennial irrigation of a large part of the Delta lands. The soil, when irrigated, is of extraordinary fertility, owing to the amount of organic matter contained in the waters of the Nile. Three crops a year may be raised wherever perennial irrigation is supplied. The crops in the winter season (December to March), when the Nile carries water in excess of actual needs of agriculture, are wheat, beans, barley, vegetables, and clover. The crops of summer (April to July) are cotton, sugar-cane, millet, rice, vegetables, and fruit. This is part of the season when the river is at its lowest. There can be little summer tillage excepting where perennial irrigation is supplied. The present irrigation plans, including the great storage reservoir above Assuan (see Nile), have in view a great extension of the area of summer crops through the release of waters stored in the flood period. The crops of the flood season are maize and millet. The total cultivated area in Egypt is about 6,000,000 acres.

In the district of the Delta most of the cultivated area is under perennial irrigation. In the region above the Delta only about one-fifth of the cultivated area has this benefit. The richest crops are raised in the Delta and in the Seil Canal areas of Upper Egypt. In the broadest sense, the staple crops are cotton in the Delta and cereals both in the Delta and in Upper Egypt. Egyptian cotton has been recognized since 1821 as supplying a long fibre unsurpassed in quality except by American Sea Island. The crop, about one-tenth as large as that of the United States, is in demand in all manufacturing countries for the finer qualities of goods in which strength and lustre of fibre are required. Cotton-culture is rapidly extending in Upper Egypt, but nine-tenths of the crop is still in the Delta. Raw silk is produced to a small extent. The rice crop is diminishing in most districts; it is barely profitable. When the extensive salt lands in the Delta along the Mediterranean shall have been reclaimed, it is expected that Egypt will grow all the rice needed. At present, large quantities are imported. Wheat and maize are very large food crops, the surplus being sent to Europe. The wheat area is about equally distributed between the Delta and the rest of Egypt, but maize-culture predominates in the Delta.

In regard to the form of tenure the land is divided into three classes: (1) The Kharaji, or land owned by the State, comprising about three-fourths of the land under cultivation, mostly rented in small parcels to the natives; (2) the Ushuri, or land originally granted in fee to large landholders, comprising less than one-fourth of the cultivated land, subject to a tax equal to about one-third of the rent paid by the fellahs or tenantry; (3) the Wakf lands, or lands belonging to the mosques and charitable institutions, and rented by them, usually for long terms. In the first half of the nineteenth century, when the treasury was impoverished by the immense expenditures on public works, the fellahs, besides being compelled to do forced labor on public works, were also forced to pay a burdensome rent in kind, and to sell their crops to the Government at prices arbitrarily fixed by the Pasha. At present the rent is paid in money, and the farmer is in no way interfered with in the disposal of his crop. He has, however, another enemy, the money-lender, whose peculations, in view of the large indebtedness of the agricultural population, seriously affect the agricultural conditions of the country. Although the legal rate of interest is only 9 per cent., the rate exacted by the money-lenders is seldom less than 40 per cent., occasionally reaching 60 per cent. Measures have been taken toward the elimination of usury by allowing the National Bank to advance small sums to the farmers at 10 per cent., and, judging from official reports, this policy seems to have been sufficiently successful to warrant its extension. The distribution of land in 1905 was as follows: Of the 1,052,418 holdings, 902,018 contained 5 feddans and under (a feddan equals 1.038 acres); 79,277 contained between 5 and 10 feddans; 38,538, between 10 and 20 feddans; 11,778, between 20 and 30 feddans; 8769, between 30 and 50 feddans; and 12,038, over 50 feddans. The chief agricultural crops and the approximate areas devoted to their cultivation are: Wheat, 1,249,000 feddans; corn, 1,776,000; cotton, 1,437,000; and sugar-cane, 67,000. There are over 5,200,000 date-trees, which besides supplying the home demand yield some fruit for export. The domestic live stock of the country is increasing in number, and includes nearly 1,000,000 sheep and goats (some wool is exported); 500,000 cattle and buffaloes, and 50,000 camels; while horses, mules, and donkeys are found in every city and village. Hogs are raised by the Copts of Upper Egypt, and bought by Greek and German butchers to sell to European residents.

MANUFACTURES. Egypt has few manufacturing establishments, and the weaving of linen and fez, which dates from an early time, is in a state of decline. There are a number of sugar refineries worked by foreign capital, Egypt having become a sugar-exporting rather than an importing country. A few cotton-mills are also operated. The making of Egyptian cigarettes is a large export industry. Tobacco-growing is prohibited, both to prevent the use of inferior home-grown leaf in the cigarette factories and also to increase the import revenues. Export cigarettes are made chiefly of Turkish tobacco. During the reign of Mehemet Ali a number of State industrial establishments were founded, but most of them have been closed.

TRANSPORTATION AND COMMUNICATION. Almost the entire foreign trade of Egypt passes through Alexandria, the shipping of that port in 1904 amounting to 6,409,000 tons, about 43 per cent. of which is carried in British bottoms. The railway lines of Egypt, with the exception of eight agricultural roads built for service on farms, are owned by the Government. At the beginning of 1905 there were 1455 miles of railway owned and operated by the State, and 780 miles of agricultural roads in private hands. Traffic on the State lines shows a decided increase. In 1895 the number of passengers hauled was 9,518,000; the tons of freight were 2,398,000; the net receipts were £994,000 (Egyptian). In 1904 the respective figures were 17,724,924, 3,529,600 tons, and £1,233,300 (Egyptian). (An Egyptian pound equals $4.943.) The agricultural roads have increased rapidly in number during recent years, with great benefit to agricultural communities.

COMMERCE. The economic development of Egypt, under the British rule, brought about by the improvement in transportation and irrigation facilities and the readjustment of the finances, is probably best shown by the increase in its foreign commerce. During the period 1896-1905 the exports of merchandise increased from £13,232,108 (in each case Egyptian) to £20,360,285, while the imports increased during the same period from £9,828,604 to £21,564,076. Naturally, Great Britain occupies the foremost position among countries trading with Egypt. The imports from Great Britain rose from £3,056,000 in 1896 to £6,928,000 in 1905. In the exports Great Britain's share is even larger, the exports to Great Britain having increased during 1896-1905 from £6,973,000 to £10,629,000. The imports from the United States amounted in 1905 to £487,865, and the exports £1,257,848. The chief exports are cotton, £15,806,447 in 1905, cereals and vegetables, £2,730,469, and cigarettes, £554,372. The magnitude of the cotton exports usually turns the so-called balance of trade in favor of Egypt. The cotton goes mostly to Great Britain, from which are imported chiefly cotton goods, wood and coal, metals, and metal products. Marseilles buys most of the cottonseed. The commercial relations of Egypt are important also with Turkey, France, Algeria, and Austria-Hungary. As the industrial development is small, the imports of textiles (over one-fourth of all foreign purchases) and other manufactures are very large. As Egypt has no forests, timber and lumber from northern Europe and Austria-Hungary are important. The United States buys Egyptian cotton to the value of two to three times that of the goods it sells to Egypt. The foreign commerce is principally in the hands of Europeans, the natives confining themselves to the internal trade.

GOVERNMENT. Egypt is a tributary State of Turkey, but the office of Governor-General or Khedive is vested permanently in the descendants of Mehemet Ali, who was appointed Governor of Egypt in 1805, and succeeded in making himself independent ruler of the country. In consideration of an annual tribute of £750,000 Turkish (a Turkish pound is $4.40), the Khedive enjoys absolute rule in Egypt in spite of the presence in his council of a High Commissioner from Constantinople. Absolute legislative and administrative power is vested in the Khedive and a council of six native ministers under his control. The ministers preside over the departments of the Interior, Finance, Justice, Public Works and Instruction, War and Marine, and Foreign Affairs. The most important offices in the ministerial departments, and especially in the departments of Public Works and Finance, are filled by Europeans. Between 1879 and 1883 England and France jointly exercised a guiding influence on the administration of the country through their controllers-general, the two nations having intervened in Egyptian affairs for the protection of their respective bondholders, whose interests were threatened by the state of disorder prevalent in Egypt. The rebellion of Arabi Pasha was followed by the abolition of the joint control of the two nations, and by the appointment of an English financial adviser, whose consent was necessary to all fiscal action. Since that time the financial adviser has steadily increased his powers, until now, through the importance of his office, he is practically the ruler of the country.

The influence of England is also made predominant by the control of the public defenses. The Egyptian Army has been drilled by English officers and is in a great measure commanded by them, the head of the national forces being an English general bearing the title of Sirdar. Besides the regular Egyptian Army there has been in the country since 1882 a British army of occupation, toward the support of which the Government of the Khedive contributes in part. The legislative power is exercised by the Khedive and his ministers, aided by the advice of a Legislative Council and a General Assembly. The Legislative Council is composed of 30 members, of whom 14 are appointed by the Government and the rest elected from the provinces and provincial towns. The General Assembly is composed of the Legislative Council, the Cabinet, and 46 members elected by popular vote. Neither of these bodies exercises absolute legislative power, since the Legislative Council cannot initiate any legislation, and the General Assembly is merely a consultative body, whose advice the Government is not bound to follow except in the imposition of personal or land taxes. Egypt proper is divided into 6 governorships and 14 mudiriehs or provinces, which in turn, are subdivided into districts and communes. At the head of the province is the mudir, who is assisted in the performance of his various functions by a sanitary board, a police bureau, and a chief engineer. He also exercises authority over the heads of districts and communities, which in turn exercise control over the representatives of the villages and municipal wards. The collection of taxes is carried on through the mudir.

Finances. The administration of the finances of Egypt may be said to be entirely in British hands, for while the Caisse de la Dette, which has charge of the payment of the foreign debt of Egypt, contains representatives of all the great European powers, the British financial adviser has control of the country's finances. In evidence of the improvement in financial conditions, it may be stated that the receipts have exceeded the expenditures since 1888, leaving a considerable surplus which is now used for public works, such as irrigation, railways, etc. The chief sources of revenue are land taxes, about 45 per cent. of the total, and taxes on tobacco and salt, public works and customs. The chief items of expenditure are the service of the debt (about £3,500,000 Egyptian), the costs of administration, and the operation of public works. The revenue now regularly exceeds the expenditure, notwithstanding the abolition of the provincial octroi in 1901 and an increase in railway expenditures. In 1905 the revenue was estimated at £14,500,000 (Egyptian), and the expenditure £12,225,000, and for 1906 at £13,500,000 and £13,000,000. The foreign indebtedness of Egypt dates from 1862, when a loan of £4,292,800 was issued for the purpose of extinguishing the floating debt. By 1870 the debt had been increased to £38,307,000, and was subsequently increased by a new loan of £32,000,000 issued in 1873. In 1876 the several issues were consolidated into one debt of £91,000,000. Owing to subsequent financial difficulties, the debt was again divided into a preference debt of £17,000,000 at 5 per cent. and a unified debt of £59,000,000 at 7 per cent., while the Daira loans were consolidated into the Daira Sanieh debt of £8,815,430 at 5 per cent. Since the passing of the financial control into the hands of European powers, many changes have been made in rates of interest, and a number of new loans have been issued. In 1905 the foreign debt consisted of the 3 per cent. guaranteed loan of £7,982,100 (English); the privileged debt of £31,127,780 at 3½ per cent.; the unified debt of £55,971,960 at 4 per cent.; the Daira Sanieh loan of £4,444,340 at 4 per cent.; and the domains loan of £1,749,160 at 4½ per cent. Reserve funds, established in 1887, amounted in 1905 to £11,834,141 (Egyptian).

Justice. Justice is administered by four classes of tribunals. There are (1) the native courts, which deal with civil actions between natives and with crimes committed by natives; (2) the consular courts, which exercise jurisdiction in the case of foreigners accused of crime; (3) the mixed tribunals, which date from 1875, and try all civil actions between persons of different nationalities and, in a measure, criminal actions against foreigners. The mixed tribunals, which were created by international action, are renewed every five years. The present tribunals were prolonged for five years by a decree of the Khedive in January, 1900. Finally, there are (4) the Mohammedan courts, conducted according to the precepts of the Koran and the general code of the Mohammedan religion. These courts deal chiefly with the questions of personal rights of the Mohammedan inhabitants. The system of native courts comprises 7 courts of the first instance for the trial of important cases, 45 summary tribunals for the hearing of cases of minor importance, and a court of appeal at Cairo. The native judges are drawn from the class of the Ulemas, or those learned in the Mohammedan law. Some attempt toward the systematization of the native jurisprudence has been made in the publication of a code of laws, which was in the main a blending of religious precepts with secular law. The administration of justice in the lower courts is under the supervision of a judicial committee, to which the judges or kadis are responsible for their action.

Population. The population of Egypt, in 1846, 1882, and 1897 was respectively 4,476,440, 6,813,919, and 9,821,045, the average annual increase being 1.25 per cent. for the period 1846-82, and 2.76 per cent. for 1882-97. Of the total population in 1897, 9,621,879 (including 573,974 nomads) were Egyptians (including fellahs, who constitute the great bulk of the people; Arab inhabitants of the towns, and Bedouins and Copts), 38,208 Greeks, 24,461 Italians, 19,557 British, 14,155 French, 7117 Austro-Hungarians, 3193 Russians, 1277 Germans, 1301 Persians, and 3284 of other nationalities. The population in the villages and smaller towns is purely Egyptian, while in the larger towns Arabs and foreigners predominate.

Religion. About 8,977,700 inhabitants or 92.23 per cent. profess the Sunnite Mohammedan faith; 731,235 are Christians (including 645,775 Copts, q.v.), and 25,200 are Jews. The Armenians have a bishop in Cairo. The Maronites are also represented. The Roman Catholics have two churches in Alexandria and two in Cairo. Missionary undertakings in Egypt have not been particularly successful. The Copts are bigoted and exclusive and not well disposed toward other Christian bodies. There is an American mission at Alexandria and Cairo, which works chiefly among the Copts and Jews. A training-school was established at Siut in 1865. Various Roman Catholic organizations, such as the Christian Brothers, Sisters of Charity, and Poor Clairs, are doing much in the way of charitable and benevolent work.

EDUCATION. Education among the natives is in a very low state. In 1897 only 5.8 per cent. of the native Egyptian population were able to read and write, while the proportion among the Coptic male inhabitants was 50 per cent., and among foreign inhabitants 74 per cent. Elementary education among the Mohammedans is mainly in the hands of private teachers or is provided for by schools attached to the mosques. At the head of the Mohammedan educational system is the great theological seminary at the Mosque of El-Azhar, the oldest and greatest university in the Moslem world. (See CAIRO.) The subjects on which instruction is given here are the old traditional branches of the Mohammedan creed; and the system of pedagogy is as antiquated as the studies which are pursued. An attempt to institute a system of public schools, made by Mehemet Ali, succeeded only in part. In 1901 there were about 10,000 elementary schools in the country, with 17,000 teachers and 228,000 pupils. Of these about 12,000 pupils were enrolled in the Government schools, primary, secondary, and professional, and 20,000 attended the mission schools supported by the various creeds—Roman Catholic, Greek Orthodox, the United Presbyterians of America, and others. Under the direct supervision of the Government there were in 1906 only 109 primary schools, 32 institutions of a higher grade, 3 secondary schools, 2 girls' academies, 16 institutions for higher or professional instruction, including the School of Law, the School of Medicine and Pharmacy, the School of Agriculture, the Polytechnic, 3 seminary schools, and 2 technical schools. The vast mass of students of all grades, therefore, still receive instruction at the hands of Mohammedan religious instructors.

ANCIENT EGYPT.

THE LAND. To the ancients, Egypt was that portion of the Nile Valley extending from the First Cataract (latitude 24°), near Syene, on the south, to the Mediterranean on the north. On either side the land is shut in by rocky ridges, which extend on the east to the Arabian, on the west to the Libyan Desert. Somewhat to the north of latitude 30°, these ridges open out to the northeast and northwest respectively, bounding a district which, from the resemblance of its outline to the fourth character in the Greek alphabet, was called the Delta. Through the Delta the Nile flowed into the sea by separate mouths. Ancient writers enumerate seven such mouths, but the course of the river has shifted repeatedly into new channels, and at present there are but two mouths, situated at Damietta and at Rosetta. The Egyptians called their land *Qêmet*, 'the black land,' from the contrast between the dark alluvial soil and the red sand of the adjacent deserts. The origin of the Greek name **Αἴγυπτος** (whence Latin *Egyptus* and our *Egypt*) is obscure. The land was divided into Upper Egypt, called 'the south,' *Qema'*, or 'the south country,' *Ta-res* (later *Pa-ta-res*, whence the biblical *Pathros*), and Lower Egypt, including the Delta (*Ta-meh*). In the earliest historical period Upper Egypt contained many marshy tracts, later filled up by alluvial deposits, and the Delta, which even now has a thin soil, was one vast marsh, though it afforded good pasturage for cattle, and was a favorite resort for hunting wild fowl. In the course of time the constant deposits of alluvial matter considerably increased the area of arable land both in the north and in the south, but, from the first, the conditions were more favorable for agriculture in Upper than in Lower Egypt, and in the time of the old Empire the Delta was far behind the southern part of the country in civilization. Upper Egypt was early divided into some twenty provinces or counties, called nomes (*νομοί*) by the Greeks, and later, in obvious imitation of this division, a similar number of nomes is found in Lower Egypt as well. At times the number of the nomes varied, but in general it was from forty to forty-two. The capitals of the nomes were each the seat of a particular divinity or group of divinities.

ETHNOLOGY. The ancient Egyptians believed themselves to be an indigenous people, free from all foreign admixture, and all the known facts tend to favor their contention. Both their language and their physical characteristics show that they belonged to the Hamitic branch of the Caucasian race, the white inhabitants of northern Africa. They represent this race very purely; the admixture of Semitic and negro blood is not considerable. Their relatives are the Berbers of northern Africa and the Bisharis, Gallas, and Somalis, of eastern Africa. The evident relationship subsisting between Egyptian and the Semitic languages has given rise to several theories. Some scholars (for example, Wiedemann and de Morgan) believe that the Egyptians and the kindred Hamitic races migrated in prehistoric times from Asia into Africa. Erman holds that at some remote period the Nile Valley was invaded by Semites, who, though few in number, were able to conquer the country and to impose their language on the conquered people. According to this theory the Egyptians were, to use Erman's own expression, 'Semitized Nubians.' Other scholars (as Palgrave, Brinton, and Keane) hold that the ancestors of both Semites and Hamites originally dwelt together in northern Africa, whence the former emigrated at a very remote period into Arabia. A very clear summary of the whole argument is to be found in Barton, *A Sketch of Semitic Origins* (New York, 1902). The weight of evidence seems to be rather in favor of the last hypothesis. The Hyksos invasion led, apparently, to little intermingling of races, but under the New Empire there was some infusion of Semite blood, especially from the slaves captured in the Asiatic wars. Under the Twenty-second Dynasty the Libyans contributed an important element to the population, and the Ethiopians (Dynasty Twenty-five) probably added some Nubian elements. The Assyrian rule was of a very temporary character, and neither this nor the Persian dominion affected the population appreciably. Under the Ptolemies there was a considerable influx of Greeks, especially into the Delta and the Fayum, and many Jews settled in the commercial cities. The Mohammedan conquest in the seventh century A.D. brought a large

Arab population into Egypt, which later received additions from the Tatar Turks. In spite, however, of all this, the old type maintained itself with considerable purity, and the Egyptian fellah of the present day is the true descendant of his forefathers under the early Pharaohs.

Government and Administration. It has been conjectured that the nomes or provinces of ancient Egypt represent the remains of a number of independent States which, in course of time, were brought together under a central authority. It is not improbable that such a condition actually existed, but, if so, it must have been at a very remote period of antiquity. Long before the beginning of the historical period Egypt had advanced to another stage of political development, and consisted of two kingdoms, the Delta and the South, with their frontier not far from Memphis. These two kingdoms were united into a single monarchy before the time of the earliest monuments; but the memory of the union was preserved in the titles of the Egyptian kings down to the period of Roman dominion. As in other Oriental countries, the Government of Egypt was, in theory at least, an absolute despotism; the will of the King was law. But in practice this was modified by various circumstances. At times, for example, the great nobles became almost independent of the Crown, and the central power was correspondingly abridged; and later the ecclesiastical power encroached upon the royal prerogative until it finally usurped the whole authority.

Under the Old Empire the Government of Egypt was organized on the basis of a great bureaucracy. The various governmental departments, at the head of which stood that of the Treasury, were systematically arranged and there was a regular gradation of officials, each intrusted with specific duties, and each directly responsible to his immediate superior. The nomes, however, occupied a somewhat peculiar position. Each nome had, to a large extent, its own internal admistration, and formed a copy in miniature of the State. It had its own treasury, its own courts of justice, and its own militia. The nomarchs, or rulers of nomes, were the heads of ancient noble families possessing large landed estates and numerous special privileges. In the troubled period which followed the close of the Old Empire they took advantage of the weakness of the central power to make themselves practically independent princes. In this way there arose a feudal system similar to that which prevailed in mediæval Europe. The nomarchs of the Middle Empire acknowledged the King as their suzerain, but they were no longer his servants. Amenemhat I., the founder of the Twelfth Dynasty, was partly successful in his effort to curb the power of these haughty nobles; but he was never able to bring them into complete subjection, and they maintained their power and their privileges down to the time of the Hyksos War. But though the bureaucratic State of the Old Empire gave way to the feudal State of the Middle Empire, there was little change in the external form of the Government, and the Treasury Department, at least, with its numerous and varied administrative functions, remained unchanged.

The Eighteenth Dynasty established a new order of things. The old turbulent nobility had been swept away in the Hyksos wars, their estates had fallen into the hands of the Crown, and the nomes were administered by royal governors. The feudal system of the Middle Empire gave way to a highly centralized military government. At the same time there was another important feature. Under the New Empire the priestly class rose greatly in importance. The immense booty derived from the Asiatic wars was lavished upon the temples, which at the same time acquired extensive landed estates. This was notably the case with priests of the god Ammon of Thebes, and the great wealth thus accumulated gave the Theban hierarchy so overwhelming an influence that they were at last able to overthrow the royal authority, and to establish a priestly dynasty (the Twenty-first), ruling upon theocratic principles. In the meantime, the army, largely composed of mercenary troops, had gained in power and importance. Many of the chief offices of the State fell into the hands of military officials, and finally the Libyan mercenaries under Sheshonk drove out the priest-kings, and established Dynasty Twenty-two.

From a very early period the system of laws was highly developed, and the administration of justice played an important part in the State. Diodorus states that the Egyptians possessed sacred books of laws the composition of which they ascribed to the god Thoth, and that other laws were enacted by various monarchs. No collections of laws have been preserved, though a number of papyri give information as to legal procedure in particular cases, both civil and criminal. Each nome had its own court over which the nomarch presided. There were also under the Old Empire six courts of wider jurisdiction, known as the 'Six Great Houses,' composed of high nobles with the Vizier at their head as chief justice. Under the New Empire, the Vizier was still the chief justice by virtue of his office, but the institution of the 'Six Great Houses' no longer existed. There were, however, district courts throughout the land. They were composed of certain high officials, and the Governor of the district usually presided. From the decision of these courts there was an appeal to the King. The judges were at all periods under the special protection of Ma't, the goddess of truth and right; they wore her image when on the bench, and many, if not all of them, were her priests.

Language. Egyptian belonged to the Hamitic family of speech, of which the principal modern representatives are the Galla, Somali, and Bishari of eastern Africa, and the Berber languages of northern Africa. Egyptian itself shows an undeniable relationship to the Semitic languages, though it is not yet determined whether this relationship depends upon an early conquest of the Nile Valley by Semites, or upon a primitive kinship between the peoples of the Hamitic and Semitic stocks. The oldest monuments of the Egyptian language go back to about B.C. 4000, and it did not die out as a spoken language until about three centuries ago. In the course of its long history it naturally underwent many changes. The language of the Old Empire, for example, was no more intelligible to an Egyptian of the Nineteenth Dynasty than Latin would be to the average Italian of the present day. Egyptologists distinguish the following chief periods of the language: (1) Old Egyptian, the classical language of the Old Empire. Long after it had ceased to be spoken, it led an artificial existence as a learned language, playing much the same part as Latin played in mediæval Europe, and was regularly employed for religious and monumental purposes down to the Roman period. Careful philological training was not, however, a distinguishing characteristic of the Egyptian scribes, and therefore texts composed in Old Egyptian after B.C. 1000 are all bad imitations of earlier monuments; those written after B.C. 500 are barbarous. The best grammar of Old Egyptian is Erman, *Altägyptische Grammatik* (Berlin, 1894; English trans., London, 1894). (2) Middle Egyptian, the popular language of the Middle Empire. It represents an intermediate stage between the language of the Old and that of the New Empire. Most of the old forms and inflections are retained, but some of the peculiarities of the later speech begin to make their appearance. This stage of Egyptian is treated by Erman in his *Die Sprache des Papyrus Westcar* (Göttingen, 1889). (3) Neo-Egyptian, the popular language of the New Empire (about B.C. 1500-1000). It is represented by a considerable number of papyri written almost exclusively in the hieratic character, and containing chiefly tales, poems, letters, and legal documents. This period of the language is exhaustively treated in Erman, *Neuägyptische Grammatik* (Leipzig, 1889). (4) Late Egyptian, the popular language in use from about B.C. 700 to the Christian Era. It is often called demotic, but this is not strictly correct, since the term demotic properly designates not the language of this period, but the script in which it is written. Late Egyptian is represented by a large number of papyri written in the demotic script. They contain chiefly legal and commercial documents, letters, and magical texts, together with a few tales. There is no good treatment of this subject. The best is by Brugsch, *Grammaire démotique* (Paris, 1855), but that is antiquated. (5) Coptic, the language of Christian Egypt, and the latest descendant of Old Egyptian. It is written in a modification of the Greek alphabet with the addition of some characters derived from demotic, and in its vocabulary it has borrowed freely from the Greek. A number of local dialects may be distinguished. As a spoken language it died out only about 300 years ago, and it is still employed as the ritual language of the Coptic Church. Coptic possesses an extensive literature, which is almost entirely of a religious character and includes many translations from Greek works. The standard grammar of the language is Stern, *Koptische Grammatik* (Leipzig, 1880); Steindorff, *Koptische Grammatik* (Berlin, 1894), is, however, better adapted to the needs of beginners. Both Erman's *Altägyptische Grammatik* and Steindorff's *Koptische Grammatik* contain useful bibliographies, which together cover all the periods of the language.

In Egyptian, as in the Semitic languages, triconsonantal stems prevailed, though even in the oldest texts many stems had been reduced by corruption to a bi-consonantal scheme. Quadriliterals and quinquiliterals were formed, chiefly by partial reduplication. As in Coptic, each word had but one full vowel, which stood either in the penult or ultima. In closed syllables it was short; in open syllables it was long. The accent of a word rested upon the syllable containing the full vowel. As in Semitic, each word or syllable must begin with a consonant. The language possessed both independent and suffixed personal pronouns, which were employed much as in Semitic. The number of the demonstrative pronouns is considerable. In Old Egyptian there was no article: the definite article first comes into use in Middle Egyptian, and the indefinite article in Neo-Egyptian. In the substantive and in the verb, two genders were distinguished, masculine and feminine, the latter standing also for the neuter. As in Semitic, the feminine ending of the substantive was *t*. There were three numbers—singular, dual, and plural, each distinguished by special endings, but the dual early became obsolete. The old inflection of the verb, formed by the addition of certain pronominal endings to the stem, resembled the Semitic perfect, and distinguished, apparently by difference of vocalization, an active-passive and a passive-intransitive form; but the former was almost obsolete at the time of the earliest texts. The later inflection was formed by suffixing a personal pronoun to a participial form. Both active and passive forms are distinguished. Auxiliary verbs are found in the oldest texts; in the later stages of the language, they are employed with increasing frequency, and in Coptic, with the exception of a few survivals, conjugation by means of auxiliary verbs in combination with the infinitive or participle has entirely supplanted the older modes of inflection. A causative was formed by prefixing *s* to the stem, and it is probable that other derived conjugations may have existed at a very remote period. There are, at least, traces of a reflexive form with prefixed *n*, like the Semitic Niphal. The verb also formed a participle, an imperative, and an infinitive; the last named had both masculine and feminine forms and was treated like a noun. The genitive relation was originally expressed by simple juxtaposition, the accent, as in the Semitic construct connection, shifting to the second word. It was later expressed by means of a particle (originally a demonstrative pronoun) placed before the *nomen rectum*. The structure of the sentence was generally simple. The prevailing order was verb, subject, direct object, indirect object. This, however, might be modified by special circumstances. A pronoun, for example, preceded a noun, and a word might be placed out of the usual order for the sake of emphasis. Consult, in addition to the grammatical works cited above: Sethe, *Das ägyptische Verbum* (Leipzig, 1899-1902), and Erman, "Die Flexion des ägyptischen Verbums," in *Sitzungsberichte der königlichen preussischen Akademie der Wissenschaften zu Berlin*, xix. (1900).

WRITING. The hieroglyphic system of writing was believed by the Egyptians to have been invented by the god Thoth, who instructed the inhabitants of the Nile Valley in its use. It is found fully developed on the most ancient monuments, and continued to be used for monumental inscriptions down to the Roman period. The latest hieroglyphic inscription dates from the year A.D. 250. (See ESNE.) The individual characters or hieroglyphs are pictures of men, animals, plants, weapons, implements, and other objects. Their number is very large, though only about five hundred are in frequent use. As regards their employment, they naturally resolve into three classes: (1) Phonetic signs, which are either alphabetic or syllabic; that is, they stand either for a single consonant or for a syllable. (2) Ideograms, which properly represent each a particular word, but are frequently used, in a purely phonetic manner, to represent any word having the same group of consonants. (3) Determinatives, or signs placed after words to indicate their meaning in a general way. For example, verbs of motion were determined by a pair of legs; names of animals, by the picture of a hide with the tail attached. The determinatives were not pronounced, but merely served as an indication to the reader. The prevailing orthography required that each word should be written by means of its ideogram (if it had one), and to this was added an indication of the pronunciation in phonetic characters. Sometimes the whole word was thus spelled out. As in all ancient systems of writing, except the Assyro-Babylonian cuneiform, only the consonants were written, the vowels being left for the reader to supply. (See HIEROGLYPHICS.) While the hieroglyphics were well adapted for monumental inscriptions cut in stone, and lent themselves admirably to decorative effects, they were very unwieldy where rapidity was essential. At a very early period, therefore, another kind of script, called the hieratic, came into use for writing on papyrus. The same characters were used, but in a more cursive form; only the essential features of the hieroglyphics were retained and these were merely indicated by a few strokes. Hieratic, therefore, differs from hieroglyphic writing in much the same way that our written letters differ from print. There was a constant tendency to give the hieratic a more cursive form when applied to business and other practical purposes, and this tendency resulted, about B.C. 700, in the development of a new script, called the demotic or 'popular' writing. Demotic was simply a very cursive script, and was developed from hieratic just as this was developed from hieroglyphic writing. It was in general use for papyri of a secular character as late as the Roman period. The most recent demotic text dates from the fifth century A.D. Throughout all these changes, the system of writing remained the same; it was merely the forms of the characters that were altered. In the second century A.D. the Egyptians seem to have realized the cumbrous nature of the demotic cursive script, and attempted to write their language in the very simple Greek characters. These attempts resulted in the development of the Coptic alphabet of thirty-one letters, of which twenty-four were borrowed from the Greek alphabet, while the remaining seven, representing sounds for which the Greek alphabet had no equivalent, were derived from demotic. In addition to its simplicity, this alphabet has the great advantage of expressing the vowels as well as the consonants. As the vowels are never indicated in the older system, Coptic becomes practically the only guide to the vocalization of all the earlier stages of the language.

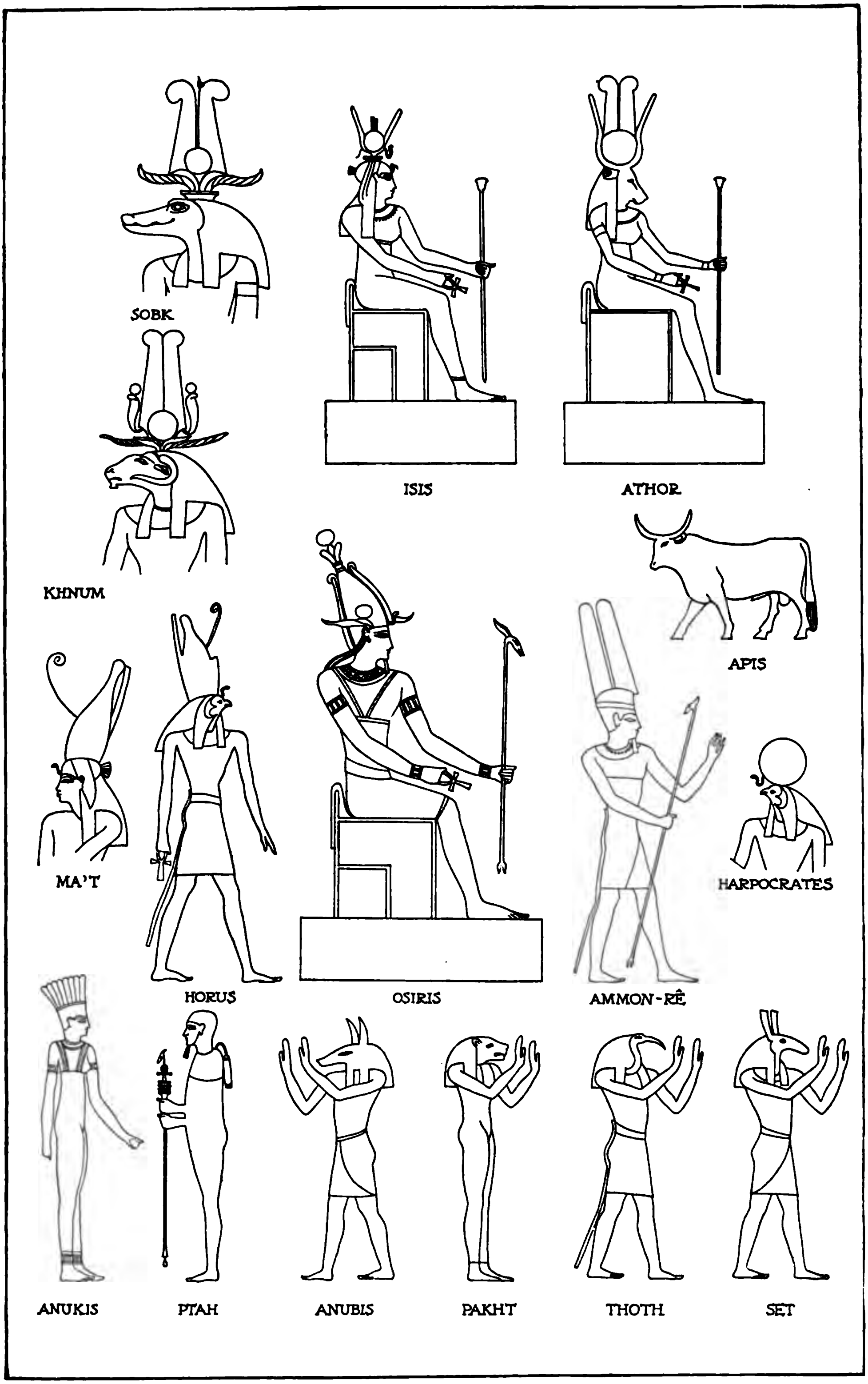
LITERATURE AND SCIENCE. That the literature of the ancient Egyptians was very rich is evident from the remains of it that we now possess. The earliest examples of religious literature are preserved in the texts engraved in the pyramids of Dynasties Five and Six, and consist of magical formulæ designed to secure the welfare of the deceased in the future life. They have been published and translated by Maspero in *Recueil de travaux* (Paris, 1882 et seq.). A later collection of texts of a similar character is to be found in the *Book of the Dead*. (See DEAD, BOOK OF THE.) The great mass of Egyptian religious literature consists of imitations of and extracts from these collections. There were, moreover, many religious myths, though but few have been preserved. Plutarch gives a very full account of the myths relating to Osiris and his family in his Περὶ Ἴσιδος καὶ Ὀσίριδος, and a few legends of the sun-god Rê are to be found on the Egyptian monuments. These are fully treated by Wiedemann in his *Religion of the Ancient Egyptians* (Eng. trans., New York, 1897). There were also a number of ritual texts giving minute directions in regard to the temple services. The rituals of the Theban divinities Ammon and Mut have been published in facsimile by the authorities of the Berlin Museum (*Hieratische Papyrus aus den königlichen Museen zu Berlin*, 1896-1901). Contrary to the expectations entertained before the decipherment of the hieroglyphics, Egyptian literature is totally lacking in works of a philosophical or speculative character. Collections of moral maxims, resembling in many respects the Biblical Book of Proverbs, seem to have been popular. Among the best known are the Proverbs of Ptah-hotep (Prisse d'Avennes, *Fac-similé d'un papyrus égyptien en caractères hiératiques, trouvé à Thèbes*, Paris, 1847) and the Prescriptions of Ani (Mariette, *Les papyrus égyptiens du musée de Boulaq*, Paris, 1872-77). All such works are, however, entirely practical in their object, and present no abstract philosophical ideas. Egyptian science was also entirely practical, and falls far short of the expectations raised by classical writers. The *Rhind Papyrus* of the British Museum is the most extensive mathematical work of the ancient Egyptians that has been preserved. Dr. August Eisenlohr published a facsimile of this papyrus accompanied by a translation and commentary under the title, *Ein mathematisches Handbuch der alten Aegypter* (Leipzig, 1877), and a facsimile in colors was later issued by the trustees of the British Museum (London, 1898). It is a mere handbook containing the solution of a number of arithmetical and geometrical problems of practical application. How, for example, to divide so many loaves of bread or so many jars of beer among a certain number of persons so that each shall receive a certain proportion; how to calculate the number of bushels of corn that can be contained in a granary of given dimensions; how to calculate the area of a field of given linear dimensions, etc. Addition and subtraction were easily handled, but multiplication or division by any number larger than two involved a very long and tedious process. Of the astronomy of the Egyptians little is known at present, though it is evident that they paid much attention to the subject. They mapped out the constellations, distinguished between planets and fixed stars, and constructed charts exhibiting the positions of the stars during the twelve hours of the night. The Egyptian year contained 365 days divided into 12 months of 30 days each, with 5 intercalary days added at the end of the year. From the earliest times great attention was paid to medicine, and the Egyptian physicians enjoyed a high reputation among the nations of antiquity. One extensive medical work, the *Papyrus Ebers* (see EBERS, G. M.), written about B.C. 1550, has been preserved, and fragments of similar works have been found. Among the latter are portions of treatises on gynæcology and veterinary medicine. (Consult Griffith, *The Petrie Papyri*, London, 1898.) Although embalming was practiced from very early times, the Egyptians never acquired much knowledge of anatomy. Their medical works are little more than collections of prescriptions, and it is evident that their practice was altogether empirical. The remedies prescribed are often most repulsive, and the repetition of magical formulæ was believed to increase the efficacy of the medicaments employed. The belief in magic was universal in all periods of Egyptian history, and the literature on the subject is most extensive. It has been seen that the magical formulæ of the *Book of the Dead* and of older collections of similar import formed the bulk of Egyptian religious literature, and, in addition to these collections, numberless charms and incantations were devised for every conceivable purpose. A most interesting collection of these incantatory formulæ is to be found in the well-known *Harris Magical Papyrus* (Chabas, *Le papyrus magique Harris*, Châlon-sur-Saône, 1860). No collection of laws has been found, though there are many documents illustrating the civil and criminal laws of the ancient Egyptians. Among the most interesting and valuable of these are the *Turin Papyrus* (translated by Renouf in *Records of the Past*, 1st series, viii., London, 1879), containing a report of the proceedings in regard to a conspiracy against Rameses III., and the *Abbott Papyrus* (translated by Horrack, *Records of the Past*, 1st series, xii.), which contains a report of the investigation of the tomb robberies in the reign of Rameses IX. (about B.C. 1100). Full accounts of these celebrated cases are given in Erman, *Life in Ancient Egypt* (New York, 1894). The poetry of the Twelfth Dynasty formed the model for all subsequent periods; it somewhat resembles Hebrew poetry, employing the same parallelistic form, but is much inferior to it. The only epic poem that has survived celebrates the victory of Rameses II. over the Hittites at Kadesh on the Orontes. It contains some spirited passages, but the action drags interminably, and the long and turgid declamations, in which the King boasts of his superhuman prowess, are wearisome to a modern reader. The authorship of the poem has been erroneously attributed to a certain Pentaur; he was, however, merely the copyist of the manuscript (*Papyrus Sallier*, iii.), which is published in the *Select Papyri of the British Museum*, part i. (London, 1842). A translation of the poem by Lushington is given in *Records of the Past*, 1st series, vol. ii. (London, 1875). In lyric poetry the Egyptians were more successful. There are many fine hymns, and the few love-songs that have survived are graceful and pleasing, though they exhibit no great depth of feeling. Good examples of the former are to be found in Wiedemann, *Religion of the Ancient Egyptians* (New York, 1897); the love-songs are collected in Maspero, *Etudes égyptiennes* (Leipzig, 1879), and are more fully treated in W. Max Müller's *Die Liebespoesie der alten Aegypter* (Leipzig, 1899).

In their entertaining literature, the Egyptians excelled all other Oriental nations of antiquity. From the earliest times they delighted in tales and stories, and the professional story-teller was as familiar a figure in ancient Memphis and Thebes as he is to-day in the bazaars of Cairo. Many of these old Egyptian tales have been preserved, and are accessible to modern readers in excellent translations. It is, of course, natural that such stories should attach themselves to famous historical personages of former days, and this is the case with the *Papyrus Westcar* (Erman, *Die Märchen des Papyrus Westcar*, Berlin, 1890), a collection of stories dating from the time of the Middle Empire. In this collection King Cheops is represented as suffering from insomnia, and calling upon his sons to entertain him with stories. We here recognize the earliest example of the familiar literary device, often employed in later times, whereby a number of persons are brought together by some special occasion which furnishes a motive for story-telling. The princes obey their father's command, and narrate, in turn, tales of the wonders wrought by famous magicians. One of these magicians constructs a small crocodile of wax, which, when thrown into the water, attains a formidable size, and seizes the lover of the magician's faithless wife. Another, by his incantations, lays bare the bed of a lake, and recovers a jewel lost by a lady of the Court, after which he returns the water to its former place. When the turn of Prince Hardadaf comes, he tells of a wonderful magician then living, and is commanded to bring him to Court. The magician, after giving some marvelous proofs of his skill, predicts that the wife of a certain priest will shortly bear to the sun-god Rê three children, who will establish a new dynasty in Egypt. The narrative then passes to the birth of the children and the marvels by which it was attended. Unfortunately, the manuscript is incomplete, and the end of the story is lost. The tale of the *Fated Prince* (*Papyrus Harris* No. 500) is based upon a motive familiar in the folk-lore of many peoples. A prince is born, and at his birth it is predicted that he will die by a crocodile, a serpent, or a dog. To prevent the accomplishment of the prediction, his father causes him to be brought up in an inaccessible castle, where he is carefully watched and tended. Attaining manhood, the prince refuses to remain thus imprisoned, and sets forth into the world to seek his fortune. He weds a princess whose watchfulness saves him from the serpent, and his faithful dog seems to be the means of his deliverance in his adventure with the crocodile. But here the manuscript breaks off, and we are left in doubt as to whether he succumbs to the third fate or is delivered from this also, perhaps by the interposition of some deity. The well-known *Tale of the Two Brothers* (*Orbiney Papyrus*) is fortunately preserved entire. In this tale two brothers live affectionately together until the wife of the elder falls in love with the younger and tempts him. He rejects her offer of love, and in revenge she falsely accuses him to her husband, who seeks to kill him. The younger brother flees from his home, and takes up his abode in a solitary place. The gods, pitying his loneliness, fashion a woman of surpassing beauty to be his wife, but she, too, proves faithless. A lock of her beautiful hair is borne by the sea to the King of Egypt, who sends his messengers, and she readily allows herself to be carried off. Her husband is slain, but is miraculously restored to life, and, after a series of wonderful adventures, becomes King of Egypt, and punishes his faithless wife with death. In addition to the wonders of magic, travels and adventure in strange lands formed a favorite theme of the Egyptian story-tellers. The story of the shipwrecked mariner, a sort of Egyptian Sindbad, who is cast upon a fabulous island peopled with serpents, and the legend of the taking of Joppa by the General Tahuti, who contrives to introduce his men into the town concealed in sacks of grain, are good examples of this kind of narrative. In all these stories the style is simple and unaffected, and the interest lies entirely in the development of the plot. Of an entirely different type is *The Story of Sinuhe* (Lepsius, *Denkmäler*, vol. vi., Leipzig, 1858), an Egyptian of high rank, who flees his country on account of some political complication, and takes refuge with the Syrian Bedouins. He is kindly received, vanquishes a redoubtable champion in single combat, and is advanced to high honor. But after a prosperous life among the Bedouins, he yearns in his old age for his native land, and applies to the Pharaoh for permission to return to Egypt. His request is granted, and, on his return, he is restored to all his former wealth and honors. In this story the plot is extremely simple, while the style is ornate and florid, and the narrative is loaded with rhetorical embellishments. Of a similar character is the story of the *Eloquent Peasant* (Lepsius, *Denkmäler*, vol. vi., Leipzig, 1858). The peasant is robbed of his ass, and applies to the chief official of his district for redress. His eloquence excites the admiration of the official, who reports the matter to the King, and by his command the case is carried on from term to term, the peasant's speeches being carefully written down and reported to His Majesty. Here the very slender thread of narrative merely serves to carry the semi-poetical speeches of the peasant, which, for the ancient reader, constituted the real charm of the book. It would seem that these very elaborate compositions were intended for a more cultured circle of readers, while the tales of magic and wonderful adventures reflect, in their simple style, the stories current among the people. The rhetorical narrative belongs, moreover, to a particular period, that of the Middle Empire. Although still cultivated to some extent by the learned, especially for educational purposes, it seems to have gone out of fashion under the New Empire, and thereafter Egyptian taste affected the simpler tales of magic and adventure. One of the latest romances that have been preserved is the tale of *Setna Kha-em-Wa'st* (Hess, *Der demotische Roman von Stne Ha-m-us*, Leipzig, 1888) found in a demotic papyrus of the Ptolemaic period. The hero, a son of King Rameses II., devotes himself to the study of magic, and descends into an ancient tomb to obtain a wonderful book of enchantment written by the god Thoth himself. He secures the book, but its possession brings unhappiness, and he is at last compelled to restore it to its place and to make expiation for having removed it. The plot of this tale is well constructed, the action advances rapidly, and the incidents are varied and wonderful. But although it is in some respects a more elaborate composition than the tales of the older period, the style is simple, and shows no trace of the straining after effect which characterizes the rhetorical narrative of the Middle Empire. Translations of such old Egyptian tales as have been preserved are given in Maspero, *Les contes populaires de l'Egypte ancienne* (Paris, 1889), and in Petrie, *Egyptian Tales* (London, 1895-99). The best translations from the various departments of Egyptian literature are to be found in *The World's Best Literature* (ed. Warner, New York, 1897); the translations in the first series of *Records of the Past* (ed. Birch, London, 1874-79) are to be used with caution.

ANCIENT RELIGION. The religion of ancient Egypt had its origin in a low kind of fetishism, or animism, of purely African character. Every village of prehistoric times seems to have had its own god or demon, worshiped in some object, usually a tree or an animal. Out of this endless pantheon, in course of time, only the 'great gods' survived; i.e. those of the principal cities. The most important deities of the surrounding places were brought into relation with the god of a city by becoming his child, his wife, etc.; thus most of the principal deities are surrounded each by his 'circle of gods.' The worship of the celestial bodies, principally of the sun, developed early, but was connected with the leading local cults, so that the sun never had one name throughout all Egypt. The earliest forms seem to be Rê and Horus, whom the theologians differentiated as the midday sun and the young morning sun, respectively (both worshiped in hawk form). In the earliest texts, however, we find Heliopolis in possession of its own sun-god, Atmu, in whom the later theological system saw the old setting sun. Osiris (the local god of Abydos and Busiris) also became the setting sun, ruling the lower heavens. In short, sooner or later, almost every local divinity was treated as a form or phase of the sun. The confusion which existed even in the earliest religious documents cannot be described. The Egyptian priests, of course, felt this confusion, but their attempts to construct a logical system were of little avail. Their genealogies of the gods, their identification of all similar divinities, who were explained as different manifestations of the same deity, their division of the world and of the natural forces among the various gods of the pantheon were contradictory, and merely served to increase the confusion. Amenophis IV. endeavored to carry the identification of the various divinities to its logical conclusion, and to establish a species of monotheism, in which the sun was worshiped as the supreme source of life and power. But although Amenophis carried on his propaganda with fanatical violence, the attempted reform did not survive his own reign. The highest development of the later religion, springing from the identification of all divinities, led to pantheistic ideas after B.C. 600; but these advanced thoughts did not touch the popular religion, which always remained attached to the old fetishistic local cults, to the worship of animals, etc.—to those features, in fact, which were so unintelligible to the Greeks that they sought to explain them as veiling higher ideas under a mysterious symbolism. The ibis Thoth (Dhouti) of Hermopolis became a moon-god and the father of science and letters, like the Greek Hermes, whom he also resembled in his function as leader of the dead. Ptah of Memphis was one of the creators of the world, being a craftsman and artist (like Hephæstus). The cow-formed Athor of Denderah eventually became the goddess of love. Ammon of Thebes, after B.C. 1600 the chief god of Egypt, is, of course, a sun-god; his wife Mut becomes the sky, and their child Khonsu the moon. At Eileithyia was revered the goddess Nekhbet, whose counterpart for Lower Egypt is Buto; at Bubastus, the cat Ubastet was worshiped; at Sais, the Libyan goddess Neit; in the Fayum, the crocodile Sobk (Souchos). The ithyphallic harvest-god Min was worshiped at Chemmis and Coptos; at Elephantine, the ram Khnumu (Chnuphis) and the goddesses Anuket and Satet. Under the New Empire, many Semitic gods were introduced and became very popular: Baal, Astarte, Anat, Kadesh, Rashpu (lightning), etc. The cult of some gods can no longer be localized; for example, that of the beetle Khepre, another creator of the world and sun-god; that of the good dwarf Bes, the patron of the dance, of music, and of female dress; that of the equally benignant female hippopotamus Tuêris, etc. The principal animals worshiped as gods were the bulls Apis at Memphis, Mnêvis at Heliopolis, and Bachis at Hermonthis, the goat at Mendes, etc. These were all incarnations of local gods. Different is the general sacredness of an animal from a divinity; thus at one place all cats were sacred, at another all dogs. It occasionally happened that in one locality an animal was proscribed and persecuted, while in the neighboring town it was held sacred, as, for example, at Bahnasa (q.v.).

Egyptian mythology seems to have been very rich; legends of the gods were attached to every sanctuary, and dramatic representations of them, in which priests played the part of gods, were given at the local festivals. Allusions to these myths abound in the religious texts, but details are rarely given, and, of all the great mass of Egyptian mythological lore, only the myths relating to Osiris and his family and a few legends of the sun-god Rê have survived. Osiris, originally the local god of Abydos and Busiris, was one of the many deities who, in course of time, acquired a solar character. He was especially identified with the setting sun, ruling the lower heavens and the mysterious region below the western horizon. He thus came to be regarded as the god of the realms of the dead, and his worship became popular throughout the land. In Egyptian mythology, Osiris was the beneficent ruler of mankind, who elevated his subjects from barbarism, and taught them the arts of civilization. He, however, incurred the enmity of his wicked brother Set, by whom he was treacherously murdered. His body, inclosed in a chest, was cast into the Nile, and floated out to sea. Isis, the sister and wife of Osiris, after a long search found her husband's body, and buried it; but it was disinterred by Set, who cut it in pieces and scattered the fragments far and wide. Isis searched out all the pieces and buried them separately. In the meantime, Horus, the young son of Osiris and Isis, grew to manhood, and avenged his father by defeating his murderer in a terrific combat. Osiris, though dead on earth, lived in the under world, and became the ruler of the dead. His sister and wife Isis may be identified with the constellation Virgo, and their child Horus is the young morning sun. Osiris has another sister, Nephthys, who is married to his brother and murderer Set (Typhon). The jackal Anubis (q.v.), the guardian of the lower world and the patron of embalmers, is the son of Osiris and Nephthys. Set may have been originally the constellation Ursa Major; he then became the personification of every force of nature opposed to the sun, the prime mover of all disorder and violence. He thus came to be a god of war, and, after B.C. 1000, a sort of Satan. Every evening he cuts Osiris in pieces (the stars), which Isis unites every morning. The parents of the hostile gods are Seb (or Gêb) and Nut—earth and heaven. The parents of these are Shu (Shou) and Tefnut (perhaps ether and moist air), while the father of all the gods is Nuu (later erroneous form Nun), the primeval abyss. The Osirian myth is very fully treated by Plutarch in his *Περὶ Ἴσιδος καὶ Ὀσίριδος*, and the general accuracy of Plutarch's account is attested by numerous allusions in the Egyptian texts. The legends of the sun-god Rê are derived from monumental sources. According to these legends, Rê appeared in primeval ages, and, after defeating the powers of darkness, assumed the government of the world. He reigned long and peacefully, but finally grew old, and his powers failed. The wise goddess Isis took advantage of his weakness to gain a long-cherished wish. She was deeply versed in magic and in all hidden and mysterious knowledge, but one thing was wanting—she did not know the secret name of Rê, upon which his power was founded. In order to learn the secret, she had recourse to a stratagem. Taking some of the god's saliva, she kneaded it with earth and formed a poisonous serpent, which she placed in the path along which Rê was wont to walk. As the god took the air with his attendants, the serpent stung him, and the poison caused him intense pain. He called upon all the gods for aid, but none could relieve him save Isis, and she would heal him only at the price of his secret name. For a long time Rê held out, but finally, no longer able to endure the torment, he revealed the secret, and regained his health through the magic powers of Isis. His vigor was, however, impaired, and even men dared to rebel against him. In his anger he called a council of the gods, in which it was decided to send the goddess Athor to destroy all mankind. In the night Athor descended to the earth, and began such a fearful slaughter that blood ran in rivers, and even the gods were appalled. Rê determined to stop the massacre. He caused beer to be prepared, and had it poured out at evening so that it overflowed the fields. In the morning the goddess, drinking copiously of the beer, became drunk, and was unable to recognize mankind. Rê was now weary of rule, and he retired to rest in heaven, leaving the god Thoth as his deputy upon earth. Consult, in regard to Egyptian mythology: Wiede-

EGYPTIAN DEITIES



mann, *Religion of the Ancient Egyptians* (Eng. trans., New York, 1897); Erman, *Life in Ancient Egypt* (Eng. trans., London, 1894).

It was at all times a deeply rooted belief of the ancient Egyptians that man possessed a spiritual part which continued to exist after death, although the precise nature of this existence was never very clearly defined. They regarded the human personality as consisting of at least three parts: the mortal, corruptible body (*khat*), the living soul (*ba*), and a sort of spiritual double, or ghost, which was called the *ka*. The *ba* or soul seems to have represented the vital principle; but it had other functions which are by no means clear. After death it was supposed to leave the body in the form of a bird, usually represented with human head and hands, and to fly up to the gods in heaven. The *ka* was an independent spiritual being, living within a man, and representing his human personality both during life and after death. It was his inseparable companion during life, and after death it hovered around his mortal remains. At times it could enter and reanimate the body; it was necessary, therefore, to preserve the body in such condition as to be always tenantable by its spiritual visitor. To this end it was incumbent upon the relatives of the deceased to have his body as carefully embalmed as their means would allow, and to place it in a tomb where it would find protection from all accidents. But although separated from the body, the *ka* still experienced hunger and thirst, and other human needs. It was therefore necessary to provide food and drink, books, games, and such household effects as would secure the comfort of the *ka* in the tomb. It was not absolutely required that material food and drink should be supplied. Magical formulæ recited over the body or inscribed upon the tomb insured to the deceased the enjoyment of "thousands of bread, beer, oxen, and geese." Such formulæ were always repeated at the funeral by the reciter-priest, and the inscriptions constantly adjure visitors to the tomb to repeat these important words.

The *ba* and the *ka* existed in the individual during life, and continued to live as separate entities after death. But when life departed from the body, the spiritual personality of the deceased assumed a new form, known as his Osiris. Of what elements this spiritual counterpart of the deceased was made up is not explained, and the Egyptians themselves seem to have had very vague and confused notions upon the subject. So much, at any rate, is clear, that just as Osiris died and lived again, so the spiritual personality of the deceased lived again and was merged in Osiris, or rather it became Osiris himself. As to where and how the individual lived after death, various ideas were entertained. He was supposed to find a home among the stars; to sit like a bird on the branches of trees; to hover around his mummy in the tomb; or to appear upon earth in various transformations. According to the most widely prevalent belief, however, the defunct was conducted by the god Anubis to the realm of the dead, where he had to undergo judgment before Osiris, the King of the Lower World, and forty-two Assessors, of strange and monstrous form. The path was beset with difficulties and dangers; gates had to be passed which opened only to those who knew the proper password; demons lay in wait to seize upon unwary souls; lakes of fire must be traversed; and many other obstacles lay in the way. But if the deceased were provided with the appropriate formulæ of the *Book of the Dead* he surmounted all these difficulties, and finally entered the judgment hall. If the judgment was adverse, he was cast into a fiery lake, or given over to be devoured by a hideous monster. If, however, the judgment was favorable, the defunct was assigned an abode in the Elysian Fields, and enjoyed a perpetual banquet at the table of Osiris. If, moreover, he knew the proper magical formulæ, he could come forth upon earth, and assume any shape he pleased; he traversed the heavens in the boat of Rê and Horus, and shared in their triumph over the powers of darkness; all earthly impurities were washed away, the divine portion alone remained, and he became a god. In the course of the final judgment, the deceased was obliged to present himself before each of the forty-two judges in turn, and declare himself free from a particular sin. This constituted the celebrated "Negative Confession," which is to be found in chapter cxxv. of the *Book of the Dead*. It indicates the existence of a high standard of morality, and is thoroughly in accord with the teaching of the moral papyri, and with many funerary inscriptions, in which the particular virtues of the deceased are detailed. It was not, however, necessary that the deceased should be actually guiltless of all the sins; it was only necessary that he should declare himself guiltless of them, and, above all, that he should know the names of the infernal judges. If he knew the proper chapter of the *Book of the Dead*, or even if it were written out and placed in his coffin, he had nothing to fear.

It is sometimes assumed that the Egyptians looked for a general resurrection of the dead and for a great day of judgment, when all mankind must answer together for the deeds done in the flesh. Of this, however, the evidence is far from satisfactory, and it would rather seem that each individual underwent judgment, and received his reward or punishment shortly after death. Consult: Wiedemann, *The Ancient Egyptian Doctrine of Immortality* (New York, 1895); Erman, *Life in Ancient Egypt* (London, 1894); Steindorff, *Religion of the Ancient Egyptians* (New York, 1905); Widemann, *The Religion of the Ancient Egyptians* (New York, 1897); Maspero, *Etudes de mythologie et d'archéologie égyptienne* (Paris, 1893). Brugsch, *Religion und Mythologie* (Leipzig, 1884-88) is full, but not critical. For illustrations, consult Lanzone, *Dizionario di mitologia egizia* (Turin, 1881-88). Champollion, *Panthéon égyptien* (Paris, 1825) is useful.

Manners and Customs. The wonderful fertility of the Nile Valley has been famous in all ages, and, under normal conditions, the produce of the soil has always sufficed to support a dense population, and to leave a large surplus of commodities for export. Agriculture was the source of Egypt's wealth, and probably the most important factor in the development of her civilization. Under these circumstances, it was natural that social conditions were largely determined by the ownership of land. In the time of the Old and Middle Empires the land was, with exception of the Crown domains, in the hands of a limited number of noble families. Neither at this time nor at any subsequent period is there any trace of a free peasantry. Throughout all ancient Egyptian history the agricultural laborer was a serf, and the condition of his modern representative, the Egyptian fellah, is hardly better.

The monuments of the older period, erected without exception by wealthy nobles, have little to say in regard to the existence of a middle class; but that such a class existed can hardly be doubted. The splendid creations of the art and architecture of the Fourth and Fifth dynasties postulate the existence of a class of artists and artisans who could plan and carry out such works. While textile fabrics might be produced by the peasant women on large estates, other manufactures required the existence of a manufacturing class. And finally, in the cities at least, there must have been merchants who handled the produce of the soil and articles of necessity and of luxury. Under the New Empire the agrarian conditions were very different. The old noble families were exterminated or impoverished in the Hyksos wars, their lands came into the possession of the Crown, and large estates eventually fell to the share of the temples. The agricultural serfs merely changed masters, and were oppressed pretty much as before; but the new conditions favored the rise of the middle class, who now came into much greater prominence, and even held important offices in the Government and in the hierarchy. The Greek accounts of the division of the people into priests, warriors, and several other classes, each containing a number of subdivisions, must not be taken too literally, and are far from proving that castes like those in India existed. It seems to be true that all occupations were highly specialized, and thus divided into a number of branches; it is also true that Egyptian conservatism very frequently caused a son to adopt his father's occupation. But there was never any restriction in regard to the choice of an occupation or against the intermarriage of classes, except in so far as such matters were affected by those social prejudices which have existed at all times among all peoples.

At the head of the whole social organization stood, of course, the King, who was not merely the supreme ruler, but the direct descendant of the sun-god Rê and therefore entitled to divine honors. After his death he was worshiped as a god. His principal wife, the Queen, was of royal birth or descent, and not infrequently the sister of her husband. Such a marriage was regarded by the Egyptians as highly advantageous, since the issue inherited a double portion of the divine blood of Rê. The Queen shared in all the honors of her husband, and, if she survived him, still possessed high influence at Court, especially if she were the mother of his successor. From motives of policy, Egyptian kings often married foreign princesses; but these ladies never stood upon the same footing as the Queen; they were all subordinate wives, but one step higher than the other ladies of the harem. In the time of the Eighteenth Dynasty an Asiatic prince sent, as a gift for the harem of Amenophis III., his eldest daughter, accompanied by three hundred and seventeen beautiful damsels. It is therefore not surprising that the Egyptian kings should have a large posterity. Rameses II. is said to have had two hundred children, and of these, one hundred and eleven sons and fifty-nine daughters are mentioned in the inscriptions of their father. At the Court great state and ceremony were maintained, and when the King appeared in public on ceremonial occasions he was attended by an army of courtiers, priests, bearers of the royal insignia, fan-bearers, officers of the household, and many other officials of various grades.

Under the Old and Middle Empires the wealth and power were in the hands of the nobles. The heads of the great families were the nomarchs, who possessed large landed estates, and, with their relatives, filled all the higher offices of Court and State. In the time of the Fourth and Fifth dynasties, the nomarchs seem to have preferred the neighborhood of the Court; but under the feudal system of the Middle Empire they usually resided on their estates, where they lived in princely style. In addition to his private property, the ruling nomarch enjoyed the revenue of the 'house of the prince,' which means the emoluments attached to his office arising from certain taxes and other sources of income. He was also, by right of birth, a member of the priestly college of the local temple, and was usually its head. Under the New Empire, though most of the old titles were retained, the offices were chiefly filled by priests and military officers. The nomarchs were no longer feudal princes, but Government officials who could be appointed or removed at the pleasure of the King or his advisers.

Before the time of the New Empire, most of the nobles and high officers of State bore priestly titles and exercised priestly functions. They monopolized, in fact, all the high offices of the priesthood, although it is probable that in most cases their duties were light and that they were only required to officiate upon certain stated occasions. The regular religious services were carried on by lower orders of priests, whose emoluments were not large and who seem to have occupied rather a subordinate position in the social organization. In addition, there were brotherhoods of so-called 'hour priests,' composed of pious laymen, each of whom devoted a portion of his time to the temple service, while the whole body took part on certain special occasions. These brotherhoods disappear under the Middle Empire.

The great wealth lavished upon the temples by the monarchs of the Eighteenth and subsequent dynasties brought about a very different state of affairs. The temples became great corporations, possessing immense wealth and large landed estates administered by their own officials and worked by their own serfs. The power wielded by the heads of these religious houses was very great, and the position of the whole priesthood was elevated in a marked degree. Apart from the material influence given them by their wealth and political power, the priests were the exclusive custodians of the higher learning, and exercised a profound influence upon the minds of the superstitious Egyptians, by whom they were credited with the possession of magical power. The priests were divided into a number of classes, according to their several functions; all classes were bound to observe scrupulous personal cleanliness, and in token of this they wore pure white linen garments and shaved their heads.

Until the New Empire there was no distinct military class. Each nome had its own militia, and the nomarch was bound to furnish a certain contingent in time of war. But the Egyptians were never a warlike people, and hence from the earliest times they depended largely upon foreign mercenaries—at first Nubians, later Libyans and Europeans. Under the New Empire the army was of vastly greater importance; some of the highest offices of the State were held by military men, and the army vied with the priesthood in political influence. At a later period in military families, who were generally of foreign origin, the connection with the army was commonly inherited, together with the field given by the Government as a fief for service. See paragraph on the Egyptian army under the title ARMIES.

The chief occupation of the Egyptians has always been agriculture. Wheat, barley, and durra (black millet) were the staple crops; but vegetables and fruits, such as onions, cucumbers, melons, grapes, and figs, were also extensively cultivated. The agricultural methods employed were rather rude and primitive. The soil was broken with a wooden plow drawn by oxen, and was laboriously worked with a heavy wooden hoe. After the seed was scattered, flocks of sheep were driven over the freshly sown field to trample down the soil. At the time of harvest, durra was pulled up by the roots; but other grain was cut with a short sickle. On the threshing-floor the grain was trodden out by the hoofs of animals; under the Old Empire these were usually donkeys, while in the time of the New Empire oxen were used for this purpose. After threshing, the grain was passed through a coarse sieve, and was then winnowed by tossing it in the air with small wooden hand shovels. It was then measured by the scribes and stored in the granaries. Cattle-raising was extensively carried on from very early times. Under the Old Empire there were still many marshy tracts in Upper Egypt which furnished excellent pasturage, and at all times the Delta was a favorite pasture-ground. Much attention was paid to the improvement of the stock, and the finest bulls were always reserved for breeding purposes. Goats and sheep were raised in great numbers. The donkey was the ordinary beast of burden, although oxen were also used. Horses are first represented on the monuments of the Eighteenth Dynasty; they were usually harnessed to chariots for war or for traveling, but were rarely ridden. Stallions were preferred to mares, and geldings do not seem to have been used until a very late period. Camels are not represented on the monuments before the time of the Ptolemies.

The Nile was the great highway of travel and traffic, and, with its numerous canals, gave easy access to all parts of the country. Timber was scarce, and the smallest boats were flat-bottomed skiffs constructed of bundles of papyrus reeds bound tightly together; they were propelled by poles or paddles, according to the depth of the water. Larger vessels were built of wood obtained from Nubia. These were also flat-bottomed, and had the characteristic form of the modern Nile boat, in which the stern has considerably more overhang than the bow, so that, should the vessel run on a sandbar, the bow could be lifted off by throwing the weight astern. These boats varied considerably, according to the use for which they were intended. Freight-vessels were broad and clumsy, resembling scows. War-vessels and boats intended for travel and recreation were often handsomely decorated. In addition to the oars, they were usually provided with a large square sail attached to a yard. It was not until the time of the New Empire that a second yard, at the foot of the sail, was added. Both yards had braces and sheets for trimming the sail. The sheets, halliards, and standing rigging were all made fast inside of the gunwale. War-vessels sometimes had a crow's-nest at the top of the mast, for a lookout or for archers. Large steering oars supplied the place of the rudder. But though they were at home in river navigation, the Egyptians were always disinclined to maritime enterprises, and therefore the carrying trade of the Mediterranean remained in the hands of the Phœnicians, while the infrequent expeditions of Egyptian ships down the Red Sea to the Somali coast (see PUNT) did not result in the establishment of extensive traffic in that direction. In the south a very important trade was carried on with Nubia, and trading posts were early established at Syene and Elephantine (q.v.), where panther-skins, ebony, ivory, and ostrich-feathers were bartered for Egyptian commodities. To the north a considerable trade was carried on by caravans with Syria and other Asiatic countries. Commerce was conducted by barter, and in the early period money of any sort seems to have been unknown. Under the New Empire metal rings were used as currency, a copper wire of given weight serving as unit. Although Egypt was chiefly an agricultural country, her manufactures were important, and were early developed. Linen was extensively manufactured, and the finer grades of the ancient Egyptian linen cannot be surpassed in modern times. The papyrus-plant furnished material for several industries. Bundles of papyrus reeds took the place of wood for the construction of small boats, and from the twisted fibres sandals, ropes, mats, sails, fishing-nets, and other objects were made. The most important use of the plant was, however, in the manufacture of paper. For this purpose the stalks were cut into thin strips, and a layer of these strips was placed upon a flat surface. Over this a second layer was placed at right angles to the first layer. The leaf thus formed was pressed out into a thin sheet, to which the natural gum of the plant gave a homogeneous character. The sheets were then dried and were ready for use.

In the working of leather the Egyptians were very skillful. The coarser leather was used for the soles of sandals and shoes; from the finer grades were made aprons, belts, coverings for chairs and sofas, harness, chariot trappings, bow-cases, and many other objects. Fine colored leather was stamped with ornamental patterns.

Good clay is to be found in all parts of Egypt, and the potter's art was very early developed. The Egyptian earthenware was made upon the potter's wheel, and was usually of a very simple character. For ornamental purposes, however, the Egyptians knew how to prepare a glazed ware resembling faïence, and of this they made statuettes, vases, beads, and other small objects.

Glass was produced at a very early period, and glass-blowing is represented in pictures of the Middle and New empires. The Egyptian artisans were proficient in metal-working, although metals had to be imported and were therefore scarce. Tools and weapons of the earliest period were made of copper, later of bronze. Iron, although known from very ancient times, was always scarce, and was therefore not extensively used. Silver was in earlier times more valuable than gold; but under the New Empire it became more plentiful, and the relative values of the precious metals were reversed. An amalgam, corresponding to the *electron* of the Greeks, and containing two parts of gold to three of silver, was much used for jewelry and ornamental purposes. The great skill of the Egyptian goldsmiths and jewelers is exhibited in many specimens of their art that have been found in the tombs. They were adepts in the use of enamels, which were beautifully colored, and they made skillful imitations of precious stones in paste.

For building purposes and for sculpture, the Egyptian quarries furnished an ample supply of stone of various kinds. From the quarries of Turah, nearly opposite Memphis, came the fine white limestone, which was used for mastabas, pyramids, and statues, and alabaster was obtained in the same neighborhood. Sandstone was obtained from the quarries near Gebel Silsileh, and near Assuan was quarried the beautiful red granite used for obelisks, columns, statues, and doorways, and for other architectural and artistic purposes. In the Wâdi Hammâmât was quarried the black granite used for statues and sarcophagi. Although working with inferior tools, the Egyptian artisans handled the hardest stones in a manner unsurpassed in modern times. Their cutting was done with a small metal chisel and a wooden mallet, and they obtained a fine polish by rubbing with pieces of quartz or with quartz-dust.

As a building material, stone was chiefly used for the construction of temples, tombs, pyramids, obelisks, and other enduring monuments; private houses were built of bricks made of Nile mud. The dwellings of the poorer class were generally mere hovels; those of the wealthy were often of considerable size and contained many rooms. The framework was of timber, and at the entrance there was often a columned portico. In some examples represented on the monuments the roof is raised above the upper story by small pillars, and the spaces between the pillars are left open to secure free ventilation. In others, an awning is stretched over the flat roof, which was, apparently, the favorite resort of the family. Country houses were surrounded by gardens with beds of flowers, alleys of trees, and artificial lakes.

The Egyptians were not a grave and philosophical people; on the contrary, they were gay and cheerful. They were fond of amusement, and their frequent social entertainments were enlivened by the performances of musicians, dancers, and jugglers. Women, as well as men, were guests at these feasts, which were not always of a very sober character. As a people the Egyptians were much addicted to the use of intoxicating beverages. Beer was the national drink; it was brewed from barley malt, and several kinds of beer are mentioned in the inscriptions. Wine also was largely consumed, and the Egyptian vineyards produced both red and white wines in abundance.

Of the many games mentioned or depicted on the monuments, the game of draughts appears to have been most popular. It was believed to form the favorite recreation of the blessed dead in the Lower World, and many draught-boards have been found in the tombs.

At all times the Egyptians took great delight in field sports. The marshes were well stocked with aquatic birds, which the sportsman, pushing among the reeds in his skiff, brought down with a throw-stick. Angling with rod and line and the spearing of fish were also favorite amusements. Larger game, especially the antelope, was hunted with hounds in the Libyan Desert, and lions were often killed in the same locality. At the popular festivals a favorite sport was the water tournament, in which the contending boatmen stood in their skiffs and sought to push their opponents overboard with long poles. Wrestling and cudgel-play were also features of these occasions, and such contests were often so earnest that the defeated contestant had to be carried from the field.

In ancient Egypt women enjoyed a much greater degree of independence than in other countries of antiquity. They appeared with their husbands at social entertainments, and took part in religious ceremonies. There were regular orders of priestesses attached to the service of the gods, and under the New Empire the priestesses, or 'singers,' of Ammon of Thebes were a very important body. At the head usually stood the Queen, and the lower grades were composed of the wives and daughters of priests, officials, military officers, and even artisans. The Egyptian laws secured to women the full enjoyment of the rights of property. A married woman, for example, could hold property at her own separate disposal, and could even lend money on interest to her husband. Polygamy was allowed, but was rarely practiced; as a rule there was but one legitimate wife, who held a most honorable position in the household, and had the direction of domestic affairs. A man might also have as many concubines as his means would allow; but extensive harems were a luxury of the rich. The Egyptians usually married young, and their large families were a source of wonder to the Greeks.

Although the higher learning was in the hands of the priests, education was rather widely diffused, and reading and writing were common accomplishments, even among the lower classes. Schools existed throughout the country; they were usually attached to the various governmental departments, and, under the New Empire at least, graduation in these schools opened the way to admission into the civil and military service of the State. The school discipline was severe, and the rod was freely administered. "The ears of the young," says the Egyptian proverb, "are placed on the back, and the boy hears when he is flogged." At first the young pupil was taught to form the characters on potsherds, papyrus being too expensive for this purpose. When he acquired some skill in writing he was set to copying moral maxims like our old-time copy-book texts, and as he advanced he copied longer extracts, and finally complete texts which were selected for their matter and style. The moral papyri containing rules of conduct and of manners were commonly used for this purpose; but poems, tales, and religious texts were also assigned. In this way the student, as he gained skill with his pen, became acquainted with the best works of the national literature. Much attention was given to the formation of a good epistolary style, and to this end students were required to copy out collections of model letters upon various subjects. Arithmetic and bookkeeping were important branches of study, and under the New Empire instruction in geography seems to have been given. Throughout the course the pupil was carefully trained in ethics, in the practical philosophy of every-day life and in good manners. The more advanced instruction was, of course, adapted to the career in life which the particular student expected to follow; but little is known as to the manner in which it was imparted.

In the care bestowed upon the dead the Egyptians surpass all other people of ancient or modern times. The means adopted were more or less elaborate in proportion to the wealth of the deceased's family, but the principle was the same in all cases. The body was first embalmed (see EMBALMING), and, after being swathed in linen bandages, was placed in the coffin. In the time of the Middle Empire magical texts (see DEAD, BOOK OF THE) designed to protect the deceased from the perils of the Lower World were inscribed upon the coffin-boards. Under the New Empire similar texts were written upon papyrus and placed within the coffin. Amulets of various kinds were placed beside the mummy or hung about its neck. When these preparations were complete, the body was carried to the tomb, accompanied by relatives, friends, and troops of hired mourners. All the Egyptian cemeteries lay upon the western side of the Nile, and hence it was frequently necessary to cross the river. When this was the case the coffin was embarked upon a richly adorned barge, and the funeral cortège followed in other boats. From the time of the Old Empire the sacred soil of Abydos was a favorite burial-place, and bodies were brought thither for sepulture from all parts of Egypt. At the place of burial the officiating priests performed the appropriate ceremonies; extracts from the sacred books were read, incense was burned, offerings were made, and the body was then committed to the tomb. Every provision was made for the comfort of the deceased. Alabaster figures of fowls, and loaves of bread, and little wooden wine-jars, were provided, which, by virtue of the charms repeated over them, acquired the properties of real food and drink. In the same way the food was supposed to be prepared in wooden models of kitchens by statuettes of cooks and bakers. Should the deceased wish for recreation, there were games of various kinds and his favorite papyri. Did he desire to travel, he might voyage in wooden models of boats which, with oars, rigging, and crew, were placed in the tomb. He was, moreover, spared the necessity of performing labor in the future life by numbers of statuettes called *ushabtiu*, or 'answerers,' which answered to his name, and took his place whenever any work was assigned to him. The tombs of the Egyptians varied with the period and with the means of the deceased and his family. Under the Old Empire wealthy nobles built the so-called mastaba tombs, flat, oblong structures of stone, which surround the pyramids of the kings of the Fourth and Fifth dynasties. From the end of the Old Empire grotto tombs, hewn out of the solid rock, were preferred. Such tombs contained several chambers, and their walls were usually adorned with sculptures and paintings. To each tomb was attached a funerary chapel, where offerings were made from time to time. Tombs of this kind were, of course, only within the reach of great nobles and wealthy officials. For persons of more moderate means, a common type of tomb, under the Middle and New empires, consisted of a small pyramid of brick standing upon a low, square base, and having a little portico in front to represent the funerary chapel. The great majority of the people were, however, buried in the ground, and the site of the grave was usually marked by a stele, on which was carved a representation of the deceased standing before a table of offerings, in the presence of Osiris and other gods. The poor were buried in shallow graves, without a coffin, and with no stele to mark the spot; but the small alabaster bowls and the bones of animals found in these graves show that even here the welfare of the deceased had not been neglected. Consult: Erman, *Life in Ancient Egypt* (London, 1894); Wiedemann, *Alt-Aegypten* (Stuttgart, 1891), and *Aegyptische Geschichte* (Gotha, 1884-88); Duemichen and Meyer, *Geschichte des alten Aegyptens* (Berlin, 1878-87); Wilkinson, *The Manners and Customs of the Ancient Egyptians* (ed. Birch, London, 1878), is antiquated, but is full of valuable illustrations.

HISTORY.

ANCIENT HISTORY. All historical books written in hieroglyphics have been lost. Their existence is proved only by fragments of a short extract (a list of kings) on papyrus, preserved in Turin. (See TURIN PAPYRUS.) Manetho, a priest of Sebennytus, under Ptolemy Philadelphus, wrote an Egyptian history in three books, which has also been lost. Epitomes of it are preserved in the works of Josephus, Julius Africanus, Eusebius, and George Syncellus; but they are inconsistent, and probably unreliable. Some historical material is found in Herodotus, Diodorus, and Eratosthenes, but it is intermingled with many errors. We are therefore compelled to rely chiefly on the inscriptions, which do not always supply adequate information. The greatest difficulty is in the matter of chronology. The Egyptians themselves had no fixed era, but dated by the regnal years of the respective kings, and the inscriptions alone do not always furnish a reliable connection between reigns. In the scanty extracts from Manetho's history, the chronological figures have been largely corrupted. Therefore the different systems of modern scholars lack uniformity. For example, the dates assigned to the first historical reign, that of King Menes, vary as follows: B.C. 5702 (Boekh); 5613 (Unger); 5004 (Mariette); 4400 (Brugsch); 3892 (Lepsius); 3623 (Bunsen); 2000 (Sharpe); etc. At the present day scholars content themselves with fixing approximate or 'minimal dates,' showing before what year a king must have reigned, though he may have lived a hundred or even a thousand years earlier. Up to the present time, no date before the eighth century B.C. has been fixed with certainty, and a fairly close approximation is possible only up to about B.C. 1600. Manetho's division of all the rulers of Egypt from the earliest period down to B.C. 342 into thirty dynasties or groups (not strictly families) has been, in general, confirmed. Dynasties One to Six are called the Old Empire; Eleven to Fourteen, the Middle Empire; with Dynasty Eighteen, the New Empire begins.

Egypt was apparently a civilized State at as early a date as was Babylonia. The possibility cannot be denied that Egyptian civilization may have been derived from that ancient centre of culture, but the evidence is not sufficient to decide the question. At any rate, long before B.C. 3000, Egypt possessed an independent culture, at least as high as that of Babylonia. The earliest history is obscure. The later priests filled many thousands of years with the mythical reigns of the different gods, after which they placed four thousand or more years of the demigods or *manes*, i.e. prehistoric kings, whose names had been lost. The Egyptians considered Menes or *Meni* from This as the first remarkable historical King. We now possess many objects which seem to date from his time, found chiefly in the two great royal tombs at Nagada and at Abydos, and possibly relics of a few earlier kings, who, even at that time, ruled over all Egypt. The time when Egypt was divided into two kingdoms, the Delta and the Southern Land, has not yet been traced by archæology, although in the royal titles the remembrance of that prehistoric division of the 'two countries' was preserved even down to Roman times. The large tombs of the kings of dynasties One and Two were situated near Abydos and This (whence Manetho calls them Thinitic kings); these tombs were examined imperfectly by Amélineau in 1896, and afterwards thoroughly by Petrie. (Consult his *Royal Tombs*, London, 1900 et seq.) Thus we can go back to the middle of the fourth millennium B.C. or earlier. Of Dynasty Three we know little more than the names of the principal kings. They resided near Memphis, and their tombs gradually assumed the later, pyramidal form. The earliest example, the step-pyramid near Sakkârah, is the work of Zoser, the fifth King of this dynasty. Under him we find the copper-mines near Mount Sinai already being worked by the Egyptians.

Dynasty Four has left a great mass of monuments. The first King, Snefru, was the first great warrior. He made expeditions into Nubia and Syria, and opened a new copper-mine at Wadi Maghârah. His two successors, the Cheops (q.v.) and Chephren (q.v.) of Herodotus, built the two largest pyramids—works which were never equaled at any later period. Later tradition ascribes the famous Sphinx near the pyramids to Chephren, but this is doubtful. Menkaurê or Mycerinus built the third in size of the great pyramids; all subsequent royal pyramids are considerably smaller. Under this and the following dynasty Egyptian sculpture reached its acme of perfection (c. 2800 B.C.). The most remarkable monument of Dynasty Five (twelve kings) is the sun-temple near Riga, of which a building in the form of an obelisk has remained. The last King, called Onnos by Manetho, inaugurated the custom of covering the chamber of the pyramid with inscriptions. This example, followed regularly in Dynasty Six, has furnished to us the extensive texts of the pyramids opened in 1880 (those of Teti or Atoti, Pepi or Apopi I., Merenrê, Pepi II., and Neferkarê). These are all magical texts, of no historic but of great linguistic interest, being copies of books so ancient that they were partially unintelligible even to the scribes of that age. Pepi I. (or perhaps Apopi —the vowels are not expressed) left numerous traces of his building activity; he also waged a great war in Palestine, for which he used many negro troops from the tributary regions of Nubia. Most of the kings of this period built their residences—every King building a new city—around Memphis; the city of Memphis itself derived its name (*Mennofer*, 'Good abode') from that of the pyramid of Pepi I., which stood in the vicinity. Pepi II. is reported to have reigned more than 90 years. Under his successor we hear of an expedition into the negro countries on the White Nile, to procure a pigmy for the King (c.2500).

Dynasties Seven to Nine form a very obscure period which has left hardly any monuments. The princes of the nomes (counties) had become so independent that the power of the King decreased. Dynasties Seven and Eight were of Memphitic, Nine and Ten of Heracleopolitan origin. The latter had to fight continually against rebellious nomarchs (counts), especially against those of Thebes, who began to claim the royal title, and finally succeeded in conquering the whole country, ruling as Dynasty Eleven. The last six kings of this family (nearly all called Antef or Mentuhotep) governed a reunited kingdom. Under them Thebes, formerly an insignificant town, first became the capital of Egypt. The last King of this dynasty, Sankh-ka-rê, has left the first report of an expedition to *Punt*. (See below.) The Twelfth (Theban?) Dynasty seems, from recent discoveries, to have begun about B.C. 2000. This period of about 200 years (seven kings, Amenemhat I., Usertesen I., Amenemhat II., Usertesen II., Usertesen III., Amenemhat III., Amenemhat IV., and a Queen, Sebknefrurê) was considered by the later Egyptians as the Golden Age, especially of literature, the poetical style of which formed the model for all succeeding periods. Of the numerous buildings of Dynasty Twelve and its renowned art, comparatively little has survived. Amenemhat III. (q.v.) was the King Moeris of Herodotus, who gained the Province of the Fa(i)yûm for agriculture, by diking off large parts from the lake, formed by a branch of the Nile flowing into that oasis. Of the so-called Labyrinth, the largest of all Egyptian temples, built at this time near the pyramid of Amenemhat III. in the neighborhood of Hawârah, only a few stones remain. It does not seem that the Twelfth Dynasty possessed more of Asia than the copper-mines near Mount Sinai, but Nubia was gradually conquered as far as the Second Cataract, where Usertesen II. established his frontier, by building two strong fortresses on both sides of the Nile. The gold-mines of that country were explored by the Pharaohs. After Dynasty Twelve Egypt fell back into the former anarchy and strife of nomarchs, and it is likely that more than 130 princes, fighting with their neighbors for the crown, did not fill more than about a century (Dynasties Thirteen and Fourteen).

Somewhat before 1700, Egypt was suddenly conquered by a foreign nation, whose rulers Manetho calls *Hyksôs*, i.e. shepherd (or foreign?) kings. We know nothing about the origin of these foreigners (they are usually taken for Canaanites or Turanians, though both theories lack proof) except that they had first conquered Syria. In Egypt they soon became Egyptianized. They kept only the Delta under their direct administration, leaving Upper Egypt to tributary native princes. The viceroys of Thebes (Dynasty Seventeen) finally threw off the yoke of the foreign sovereign Apoph (is). After a long struggle, during which the Thebans Seknenrê III. and his successor Kames died, Amasis I. (Aahmes or Ahmose) put an end to the rule of the Hyksos by conquering their capital and chief fortress Avaris (or *Hat-uaret*) on the northeastern frontier (c. 1600). Pursuing them into Palestine, Amasis, the first ruler of Dynasty Eighteen, inaugurated the period of conquests in Asia. His unlimited power (the dominion of the many nomarchs had been wiped out during the long Hyksos war) and his army, disciplined and trained in the war of independence, enabled him to conquer Palestine and Phœnicia. His son Amenophis (Amenhotep) I., dying after a brief reign, became the patron saint of the Theban necropolis. Thothmes (also called Dhutmose) I. penetrated into Nubia beyond the third cataract, and into Syria as far as the Euphrates. His son, Thothmes II., had to share his power with his energetic sister and wife Hatshepsu (Hatasu), who also kept his minor successor Thothmes III. (her nephew?) under her control for twenty-two years. In one of the finest buildings of Egypt, her temple at Deir el-bahri, is depicted as the most remarkable event of her reign the equipment of a whole fleet to sail to the Abyssinian and Somali coast, called Punt (*Phut* in the Bible), in order to bring back gold, rare animals, and, above all, incense, together with some living incense-trees to be planted at Thebes. Formerly only single ships had been sent to Punt.

After Thothmes III. had come to power by Hatshepsu's death (c. 1500), he showed himself the greatest conqueror among the Pharaohs. In at least sixteen campaigns, he conquered Palestine, Phœnicia, and Syria as far as the Lower Orontes, and penetrated victoriously as far as northern Mesopotamia (Mitanni), storming Karkemish on the Euphrates, and hunting elephants in that region. With his rich booty he embellished the temples of Egypt in a manner unequaled by any of his predecessors, though they had all been great builders. The gigantic Temple of Ammon at Karnak is chiefly his work. His son Amenophis (Amenhotep) II. (c. 1480) maintained the Egyptian possessions in Asia, and so did Thothmes IV., but Amenophis II. gradually lost the northern regions. He lived on good terms with Mitanni, and married the sister of its King Dushrata. For an account of the cuneiform dispatches received from Asia during the reign of this King and that of his son, which were found near Tel el-Amarna, see AMARNA LETTERS.

His son, by the beautiful and influential Queen Teye, Amenophis IV. (about 1410), caused a great revolution by trying to replace the old religion with a solar cult, approaching monotheism. He persecuted the worship of the supreme god Ammon with special vehemence, carrying his animosity so far as to obliterate the name of the god from earlier monuments, and to change his own name, which contained that of Ammon, to "The Splendor of the Sun" (Akhunaten). He removed his residence from Ammon's city, Thebes, and built a new capital at Tel el-Amarna in Middle Egypt. After his death (about 1395), the new religion, which had previously met with great opposition, was destroyed together with its temples under the following ephemeral kings: Smenkh-ka-rê, Tutankhamôn, and Ay. King Haremheb (about 1380) completed the restoration of the old creed.

With the short-lived Rameses I., Dynasty Nineteen (about 1350) begins. Sethos (Sety, Seti, or Setoy) I., his successor, a great warrior, whose tomb in Bibân el-Moluk is the finest of all the royal tombs there, attempted to win back the parts of Middle Syria which had been lost, and was there entangled in a war with the Kheta or Hittites, whose kingdom seems to have had its original centre in Cappadocia. His son Rameses II., or Sesostris (c. 1330 B.C.), continued this war for twenty years with varying success. Finally at the peace concluded with the Hittites, and sealed by a marriage between Rameses and the daughter of their King, Syria was divided, and Egypt retained Palestine and the southern half of Phœnicia. The numerous representations of a few modest victories (chiefly that near Kadesh on the Orontes, later Laodicea and Libanum) made the Greeks believe that Rameses II. had been the conqueror of half the world. However, his activity as a builder during his reign of sixty-seven years was beyond comparison, though he usurped many monuments, replacing earlier names by his own. Perhaps two-thirds of all the monuments bear his cartouche. As he colonized Goshen (the modern Wadi Tumilât) and built there the cities of Pithom and Rameses, he has been pointed out as the Pharaoh who oppressed the Israelites, and his son has been deemed the Pharaoh of the Exodus. But an inscription, found in 1896, shows that, in the fifth year of his son Mernephtah, Israel was already settled in Palestine, and that an earlier date must be sought for the Exodus. On the other hand, it is clear from the Amarna Letters (q.v.), written about B.C. 1400, that at that time Israel had not yet entered the Promised Land. The date of the Exodus must, therefore, be placed in the interval between these two extreme limits, or, in round numbers, between B.C. 1400 and 1250. The theory is sometimes advanced that the ancestors of Israel settled in Egypt under the Hyksos kings, but there is no evidence in support of this view. In fact, with the single exception of Mernephtah's inscription, there is no mention of Israel in the Egyptian records, and nothing is known in regard to the date of the chosen people's settlement in Egypt or the length of their sojourn there. All theories upon this subject are based upon little more than pure conjecture. Under Mernephtah, the Libyans devastated the Western Delta, and pirates from Asia Minor and Europe ravaged its shores—the Akaywash (Achæans ?), Tursh (Tyrsenians?), Shardîn (Sardinians) and Lûk (Lycians). These enemies joined their forces, and had almost reached Memphis when they were met by the Egyptian army and utterly annihilated. Dynasty Nineteen ends ingloriously with three kings (of whom one is said to have been a Syrian usurper) and a queen.

Setnakht, the founder of Dynasty Twenty, reëstablished order. His son, Rameses III. (c.1210 B.C.), repelled several invasions of the Libyans, and defended Egypt and the Syrian provinces from the raids of the pirates mentioned above, as well as from barbarians coming by land from Asia Minor. A branch of the latter, however, the Philistines, settled in Palestine at that time. Rameses plundered the land of the Amorites north of Palestine. His palace and favorite temple was at Medinet Habu. The nine Ramessides after him reigned peacefully to about 1100, when the high priests of Thebes, who had become very rich, especially through the donations of Rameses III., took the crown. They had soon, however, to yield to a new dynasty (Twenty-one) from Tanis. At that time, the police of Thebes gave up the task of protecting the royal tombs of dynasties Eighteen to Twenty against thieves, and hid most of the royal mummies in a secret pit, where they were discovered in 1881. A few tombs, which a landslide had made inaccessible to thieves and police, were discovered intact in 1898.

The Libyan mercenaries had meantime become so powerful that Dynasty Twenty-two (about 950) was founded by one of their generals, Shoshenk I. (the *Shishak* of the Bible), who plundered Judea and Israel under Jeroboam and Rehoboam. His successors were called Shoshenk (3), Usorkon (3), Takelot (2), and Pimay. Under Dynasty Twenty-three (from Bubastus, about 800) the country again split up into many small kingdoms ruled by Libyan officers, and the way was thus left open for the attacks of the kings of Ethiopia (q.v.), who had been independent since Dynasty Twenty-one. About 750, the Ethiopian Pankhy (or Piankhy) was prevented from subjecting all of Egypt by the resistance of Tefnakht, the ruler of Sais and Memphis; but Pankhy's grandson Shabako succeeded in dethroning Tefnakht's son, the wise Bocchoris (*Bok-en-renef*), with whom Dynasty Twenty-four came to an end (c. 720 ?). The Ethiopians form Dynasty Twenty-five. After Shabatako, Taharko (the *Tirhaka* of the Bible; c. 700?) pursued a policy hostile to Esarhaddon, King of Assyria, who attacked Egypt in 673, and conquered it in 670. The Assyrian monarch divided the country among twenty tributary princes, descendants of the old Libyan families. The Ethiopians twice again invaded Egypt in 667 under the new King Tan(u)t-amen, but unsuccessfully. The Assyrian vassal Psammetich, Prince of Sais, a descendant of Dynasty Twenty-four, aided by Greek and Carian mercenaries, made himself independent master of the country (663), when Assyria's power declined. The new dynasty (Twenty-six) is remarkable for its revival of art with archaistic tendencies. Psammetich's son Nekao (Necho) II. (609-594), slew Josiah of Judah, and conquered Syria as far as the Euphrates; but he soon lost it to the new Babylonian Empire, being defeated by Nebuchadnezzar at Carchemish. Necho dug the first canal connecting the Nile, and thus the Mediterranean, with the Red Sea. He also built a fleet, and sent Phœnician sailors around Africa. Apries (*Uahabre*, the *Hophra* of the Bible, 588-569), the successor of Psammetich II., vainly tried to prevent the destruction of Jerusalem by Nebuchadnezzar (586). Amosis II. (Amasis, 569-526), in consequence of a military revolt, first took Upper Egypt, and three years later slew Apries in battle. With diplomatic skill he maintained himself against the Babylonians, and later against the Persians; but his son Psammetich III. closed this flourishing dynasty by a reign of only one year. In 525 Cambyses defeated him at Pelusium, and Egypt became a Persian province.

The revolts of the Libyan officers Khabbash (487), Inarus, and Amyrtæus (460-450, aided by the Athenians) were suppressed; but in 414 the Persians were expelled, and Egypt was free from their rule until 343. In the interval, however, the country was a prey to internal strifes. The Persian reconquest was followed by many cruelties; the last Egyptian King, Nectanebus, fled to Ethiopia. Alexander occupied Egypt in 332, and founded Alexandria in 331. On the death of Alexander (B.C. 323) one of his generals, Ptolemy, son of Lagos, became Macedonian governor of Egypt. From the first he was virtually an independent ruler, though he did not assume the royal title till B.C. 306. He was a wise and politic sovereign, and under his reign Egypt became a power of the very first rank. He conciliated his native subjects by treating with respect their religion and the long-established customs of the country. Under Ptolemy and his successors Alexandria, the new capital of Egypt, increased rapidly in importance, and soon became the foremost city of the world. Its commerce was far-reaching, and brought vast wealth into the hands of its merchants. As a centre of literary culture it was even more famous than as a centre of commerce. The celebrated museum and library founded by Ptolemy I. exerted a profound influence and attracted to Alexandria men of letters and of science from all parts of the Hellenic world. Ptolemy I. died in B.C. 284. His grandson, Ptolemy III. (B.C. 247-222), waged a successful war with Syria, and greatly extended the foreign possessions of Egypt. After this there followed a period of steady decline. Antiochus the Great of Syria and Philip V. of Macedon deprived Ptolemy V. (B.C. 205-181) of his Syrian and Ægean possessions, and but for the intervention of Rome would have seized Egypt as well. Henceforth, although her commerce increased in importance, and Alexandria was still the great centre of literature and science, Egypt existed as an independent kingdom only by the sufferance of Rome, and lost all external influence. Ptolemy XIII. (B.C. 80-52) bequeathed his kingdom to his elder daughter Cleopatra (q.v.) and his elder son Ptolemy XIV. Cleopatra made herself sole ruler, and finally terminated an adventurous career by suicide in B.C. 30. With her the kingdom of the Ptolemies came to an end, and Egypt became a Roman province.

Augustus made Egypt a Roman province under a Governor of equestrian rank. It remained rather a quiet possession of the Romans. Many temples were erected under the Roman dominion. The invasion by the Ethiopians (B.C. 24) and that by Zenobia of Palmyra (A.D. 270) are the most important events of this period. The rapacious desert tribes of the Blemmyans were often troublesome. Christianity spread with special success among the Egyptians. Agnosticism and monasticism (on heathen models) had their origin here. Paganism was persecuted and forbidden in A.D. 391, being tolerated only on the island of

Philæ until the reign of Justinian. Schismatic contests among the Christians did much harm.

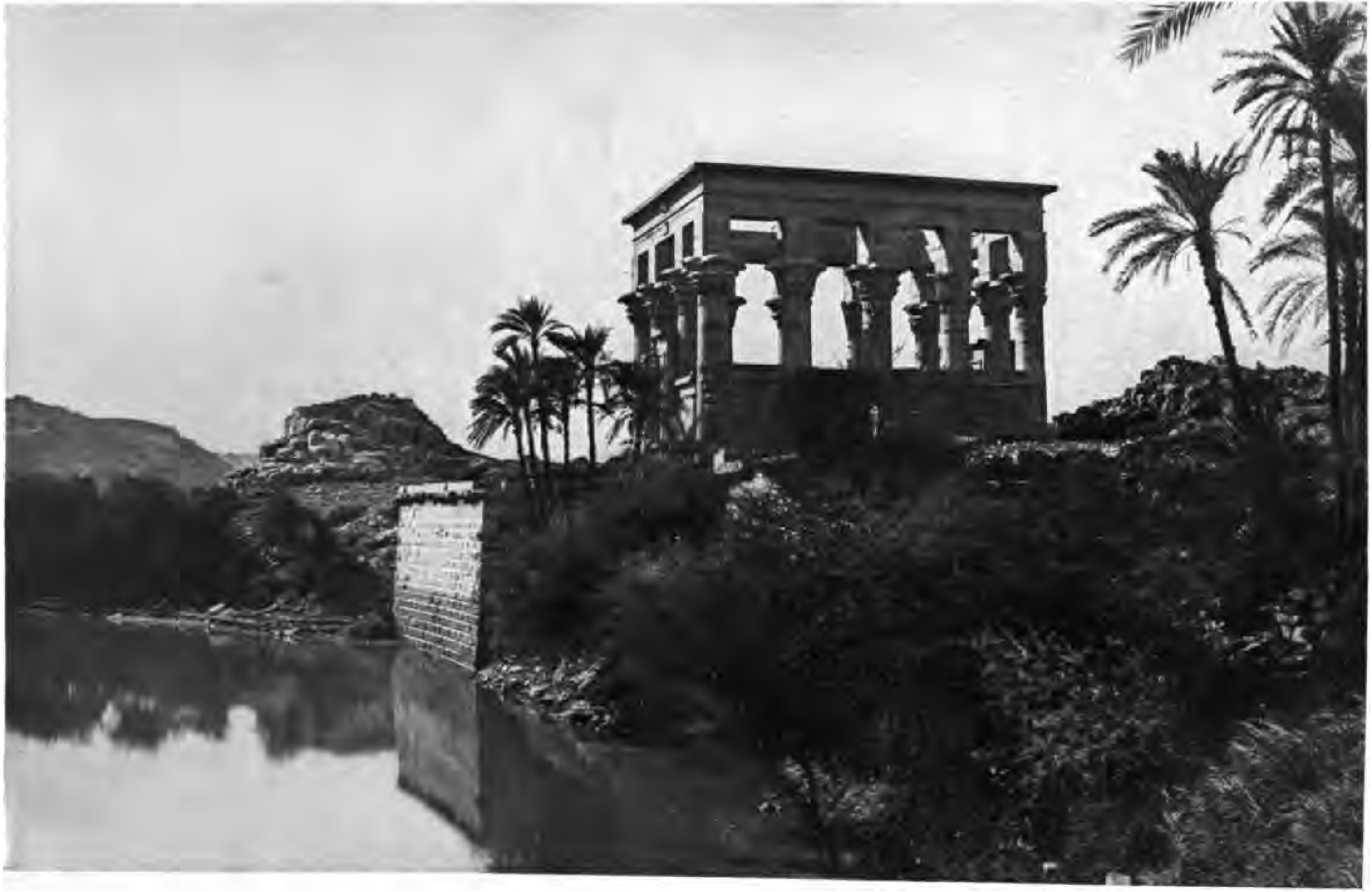
Egypt After the Fall of Rome. After the fall of the Roman Empire, Egypt almost disappeared from the knowledge of Europe; but it occupied an important place in the Mohammedan world. It was conquered by the Arabs under Amru (A.D. 639-41), and in 969 became the seat of power of the Fatimite dynasty, and its capital, Cairo, was one of the religious centres of Islam. The Ayubites succeeded the Fatimites, and under Saladin (1171-93) united much of the Mohammedan world under their rule. In the thirteenth century it was politically and commercially the real heart of Mohammedanism, and the later Crusaders made it their objective point, with the idea of striking at the vital seat of the enemy's strength. The Crusaders took Damietta in 1219; but were caught in the Delta on the march to Cairo, and forced to cede all their conquests (1220). Damietta was again captured in 1249, by Louis IX. of France; but his army met a similar fate to that of the warriors of the Fifth Crusade, in advancing on Cairo. In the retreat upon Damietta the army was destroyed, and the King was captured and compelled to pay a large ransom, a part of which was the surrender of Damietta. Under the Mameluke sultans (1250-1517), vigorous warriors but poor administrators, the country fell into poverty and anarchy. The Turkish conquest (1517) by Selim I. left the power of the Mameluke chiefs nearly unchanged. In 1798 Napoleon Bonaparte invaded Egypt and defeated the Mamelukes near the Pyramids; but the French forces in Egypt were expelled by the Turks, with British help, in 1801. In 1811 Mehemet Ali Pasha (q.v.) massacred the Mamelukes, and formed an army which conquered parts of Arabia (1816) and Nubia (1820-22), but lost many troops in aiding the Porte during the Greek Revolution. Mehemet Ali founded the present ruling dynasty, and established himself as a practically independent ruler. In 1831 he rebelled, conquered Syria, and developed designs upon the whole Ottoman Empire; but in 1840 the intervention of Russia, England, Austria, and Prussia forced him to evacuate Syria and renew his allegiance to the Porte. He improved the agriculture and defense of the country, but nearly ruined the people by taxes and monopolies. He died in 1849, and his successors, his grandson, Abbas Pasha (1849-54), and his son, Said Pasha (1854-63), restored prosperity to the country and began the Suez Canal. Ismail Pasha (1863-79), who first received the title of Khedive or Viceroy from the Porte, promoted the construction of the Suez Canal by De Lesseps, extended the conquest of the Sudan begun by Mehemet Ali, but was forced by the Porte several times to reduce his army and navy. Upon his accession the Egyptian debt was $16,000,000; in 1879 it had risen to $500,000,000. English and French banking houses were largely concerned in the solvency of the Egyptian Government, and in 1875 the Khedive sold his 176,602 shares in the Suez Canal for £4,000,000 to England, thus laying the foundation for that country's influence in Egypt. In 1876 the revenue was put under the management of European commissioners: in 1878 the Khedive's private property went to help the payment of the interest on the public debt. His reckless extravagance made the Egyptian Question one of European politics, and it was closely associated with the Eastern Question (q.v.) by the opening of the Suez Canal.

When Ismail, in 1879, dismissed his financial minister, Nubar Pasha, and refused the payment of interest, the European governments forced his abdication in favor of his son Tewfik (1879-92). In 1880 a dual British and French control was established, which caused a nationalist revolt in the following year, headed by Arabi Pasha (q.v.), a colonel in the army. The demands of the insurgents were that the army should be increased to its normal strength, that the Prime Minister of the Khedive, Riaz Pasha, should be dismissed, and that a Chamber of Notables, or National Parliament, should be convened to assume the government of the people as a representative body. Tewfik was alarmed by the proportions which the revolt had assumed, and a Chamber of Notables was summoned, which met at Cairo before the end of the year. In 1882 Arabi was taken into the new Cabinet as Assistant Secretary of War. When it was found that France and England, through the Controller-General, were inclined to resist all the demands of the Chamber that would limit foreign interference in the management of the finances, the resentment of the popular, or national, party rose to fever heat. Sherif Pasha, the new Premier, favored the European powers. He was therefore forced to resign, and a new Ministry was appointed, with Mahmud Sami and Arabi Pasha at its head. But the Khedive and his Ministry represented such opposite lines of policy that it was evident that a rupture between them was inevitable, and in the middle of May the crisis came. The Khedive's action in pardoning certain political offenders was violently attacked by the Nationalists, and England and France each sent out a fleet to Alexandria to maintain the authority of the Khedive, and demanded the resignation of the Ministry and the exile of Arabi. The Ministers obeyed, but a popular outbreak caused the Khedive to reinstate Arabi. He was now the idol of the army and the populace, who, encouraged by their success, were threatening violence against their foreign oppressors. An ordinary street fight in Alexandria culminated in a general uprising of the native populace against the Europeans, June 11th. Arabi was commissioned by the Khedive to restore order; but his known sympathy with the rioters only increased the panic of the foreign colony, which fled from the city. England and France had vainly urged the Sultan to send troops into Egypt to enforce the authority of the Khedive and to suppress the growing power of Arabi, who was virtually dictator of the country. As the French hesitated to act, the English took matters into their own hands. A *casus belli* was found in the fact that certain forts in the harbor of Alexandria were being armed by orders of Arabi. The English admiral, Sir Beauchamp Seymour, accordingly bombarded the town. On the next day (June 12th) the insurgents evacuated Alexandria, leaving it in flames, and intrenched themselves at Kafi Dowar, about 12 miles distant. The Khedive sought refuge with the English fleet. He was formally deposed by the Nationalists, who organized a

Provisional Government at Cairo, and intrusted the defense of the country to Arabi. Meanwhile the English, after an ineffectual siege of some weeks, abandoned the attack on Kafi Dowar, and an Anglo-Indian army of 40,000 men was sent across the Isthmus of Suez, under command of Sir Garnet Wolseley. They landed at Ismailia and advanced to Tel el-Kebir, where a large army of insurgents had thrown up intrenchments. These were stormed September 13th. A forced march was then made on Cairo, which was reached by nightfall. Arabi at once surrendered, the National army was disbanded, and the Khedive was restored to his authority. Arabi was sentenced to death, but the sentence was commuted to exile on the island of Ceylon.

Various reforms were introduced by the English, acting through Lord Dufferin, who was appointed Special Commissioner to Egypt. The French having taken no part either in suppressing rebellion or in the subsequent reorganization, the dual control came to an end in 1883, notwithstanding the protest of France. An army of occupation was deemed necessary for a while to preserve tranquillity; but it was promised that its size should be steadily reduced. This promise, owing to a serious outbreak of the Arabs in the Sudan (q.v.), and the inherent weakness of the Khedival Government, was not redeemed. Egypt became practically a dependency of England, garrisoned by English troops, and with a Government whose policy is in all things directed by the representative of England, though still carried out in the name of the Khedive. The Suez Canal, the new gateway to the East, and the strategic position of Egypt with reference to the development and control of Africa, gave that country a new importance, especially for Great Britain. Egypt is still nominally a province of the Ottoman Empire; but the Government of Great Britain, where half of the Egyptian national debt is held, undertakes to represent the foreign creditors. The commander of the army, known as the Sirdar, is an English officer. There is an International Court, on which thirteen European countries and the United States are represented, which has jurisdiction in cases in which foreigners are concerned. The Khedive and the Government may be held responsible before this court. The finances are guarded by the International Debt Commission, on which all the great Powers of Europe are represented. Under British control the expenditures have been brought within the receipts, taxes have been reduced, and compulsory labor and slavery have been abolished. The Sudan, subject to Egypt in some measure since 1820, with its fanatical tribes of fearless though barbaric warriors, was a problem for the administrators of Egypt to deal with; its control was of great strategic importance, and it was a centre of the slave trade. In 1874 Charles George Gordon (q.v.) was appointed Governor-General of the Sudan, and succeeded in partially organizing the country and suppressing the slave trade. He was succeeded in 1881 by Raouf Pasha, under whom the country relapsed into barbarism. The advent of the Mahdi (q.v.), Mohammed Ahmet, in 1883, brought religious fanaticism into the struggle against Egyptian control. The rapid increase of the Mahdi's power and the defeat of the Anglo-Egyptian army under Hicks Pasha led the Government to send General Gordon back to the Sudan in 1884. He was soon cut off in Khartum, and the relief expedition under Wolseley arrived too late (January 28, 1885) to save him. The Sudan was left to itself until 1894, when Sir Herbert Kitchener, in a series of campaigns which proved the quality of the new Egyptian army, succeeded in reëstablishing the authority of the governments over the Egyptian Sudan, his final triumph being the battle of Omdurman (September 2, 1898). The defeat and death of the Khalifa in the battle of Om Debrikat in 1899 and the capture of the last Mahdist leader, Osman Digna, in the following year hastened the pacification of the country. Tewfik's son, Abbas Hilmi, who had been educated in Europe, succeeded as Khedive, January 7, 1892, and proved an able and enlightened ruler. Lord Cromer, the British Consul-General, has had a predominant influence in shaping the course of affairs in Egypt. The economic rehabilitation of the country has proceeded rapidly, chief among the works of public utility undertaken being the great Assouan dam completed in 1902. By the Agreement of April 8, 1904, between France and Great Britain, the former pledged itself to abstain from interference with British policy in Egypt by not insisting upon the definite settlement of the question of occupation. In 1906 the question of the boundary between Egypt and Arabia in the Sinai peninsula led to strained relations between Great Britain and Turkey (q.v.).

BIBLIOGRAPHY. Art and Architecture: Consult: Perrot-Chipiez, *History of Art* (Paris, 1883); Maspero, *Egyptian Archæology*, trans. by Edwards (London, 1889); Petrie, *Egyptian Decorative Art* (London, 1895). See OBELISK; PYRAMID; SPHINX. Monuments and Archæology: Rosellini, *Monumenti dell' Egitto e della Nubia* (Pisa, 1832-44); Champollion, *Monuments* (Paris, 1835-45); Lepsius, *Denkmäler* (Berlin, 1849-59). Ancient History: Petrie, *History of Egypt* (London, 1894 et seq.); Budge, *History of Egypt*, vol. i. (Oxford, 1902); Brestead, *History of Egypt* (New York, 1905). Mediæval History: Weil, *Geschichte des Abassidenchalifats* (Stuttgart, 1862); Quatremère, *Histoire des Sultans Mamelouks* (Paris, 1837-41). Of scientific journals, the *Zeitschrift für ägyptische Sprache* (Berlin), *Récueil de Travaux* (Paris), and *Sphinx* (Upsala) are the most important. On the modern inhabitants, the classical work of Lane, *Manners and Customs of the Modern Egyptians*, new ed. (London, 1882), is still unsurpassed. ● Consult also in general: Ebers, *Aegypten in Bild und Wort* (Stuttgart, 1879-80); trans. by Clara Bell under the title *Egypt, Descriptive, Historical, and Picturesque* (London, 1881-82); Lane, *Manners and Customs of the Modern Egyptians*, new ed. (London, 1882); Poole, "Egypt," in *Foreign Countries and British Colonies* (London, 1881); id., *Social Life in Egypt* (ib., 1884); Hervé, *L'Egypte* (Paris, 1883); Wallace, *Egypt and the Egyptian Question* (London, 1883); Malortie, *Egypt: Native Rulers and Foreign Interference* (ib., 1883); Neumann, *Das moderne Aegypten* (Leipzig, 1893); Borelli, *Choses politiques d'Egypte 1883-95* (Paris, 1895); Fircks, *Aegypten 1894* (Berlin, 1895-96); Wood, *Egypt under the British* (London, 1896); Bourguet, *La France et l'Angleterre en Egypte*



EGYPTIAN ARCHITECTURE
TEMPLE AT PHILÆ

(Paris, 1897); Cameron, *Egypt in the Nineteenth Century* (London, 1898); Penfield, *Present-day Egypt* (ib., 1899); White, *The Expansion of* Egypt (ib., 1889); Milner, *England in Egypt* (ib., 1899); Boinet Bey, *Dictionnaire geographique de l'Egypte* (Cairo, 1889); Bénédite, *Egypte* (Paris, 1900); Royle, *The Egyptian Campaigns 1882-85*, new ed. continued to 1899 (London, 1900); Brehier, *L'Egypte de 1789 à 1900* (Paris, 1901); and Prince Ibrahim Hilmy, *The Literature of Egypt and the Sudan, from the Earliest Times to the Year 1885, Inclusive: a Bibliography* (London, 1886-88).

EGYPTIAN ART. The art of Egypt is, next to that of Babylonia, the earliest in the world's history. Its origins have been investigated during the last five years with better success than ever before, especially by English archœologists, such as Petrie, and French explorers, as de Morgan. The proofs of Egyptian civilization which they have found, belonging to the First and the Second dynasties, come into the domain of archæology rather than art, consisting of the contents of small tombs—arms, ornaments, and utensils. Relics of the stage of prehistoric antiquities of the Stone Age have also been found, though it has not been proved apparently that the relics actually antedated the historic dynasties, rather than that they belong to another less advanced race, perhaps contemporaneous with the first kings mentioned by Manetho.

The four or five thousand years of Egyptian art, from the First Dynasty to the time of the Roman Empire, fall for all practical purposes into four main periods: (1) Old Empire (c.4000-3000); (2) Middle Empire (c.3000-2100); (3) New Empire (c.2100-324); (4) Greco-Roman revival (B.C. 324-c.300 A.D.). The Christian art that follows, whether Coptic or Byzantine, is less Egyptian than cosmopolitan. During these more than four millenniums art retained great unity of style as soon as it had reached—probably during the Third Dynasty—a mastery of the technique of the various branches of art; although certain forms, such as temple architecture, were not developed until as late as the Eleventh Dynasty.

ARCHITECTURE. The monuments of the Old Empire (First to Sixth dynasties of Manetho) belong rather to engineering than to architecture, but, with all their simplicity, possess great material grandeur. There is as yet no temple architecture. A temple found by Petrie at Meidûm is apparently an exception; otherwise the shrines are merely parts of the pyramids. (See PYRAMIDS.) These gigantic tombs, over a hundred in number, were erected for the burial of members of royal and noble families, and each one contains a burial-chamber and a number of passages. The earliest dated pyramid is the stepped structure at Sakkârah, 190 feet high in six stories, built of brick. There are similar structures at Abusir and Meidûm. These imply possibly a knowledge on the part of the Egyptians of the stepped temple pyramids of Babylonia, also of brick. But stone soon came to be the material used for the Egyptian pyramids. This is illustrated by the three famous examples at Ghizeh, all belonging to kings of the Fourth Dynasty; Khafra, Menkaura, and Khufu (Cheops), that of the last-named the greatest of all, being 482 feet high. For persons not of royal blood the tomb took the form of a rectangular structure. (See MASTABA.) The best-preserved shrine of this period is the so-called Temple of the Sphinx (q.v.), of extremely primitive architecture, consisting of a hall in the form of a T roofed with plain stone lintels on sixteen perfectly plain square stone piers. There is an entire lack, during this first period, of any architectural memberment or decoration. No style has yet been formed. The Middle Empire shows a considerable change. Architectural orders are originated; columns and shafts of many profiles; capitals of many designs. The lintel was made the basis of design, and the vault relegated to engineering works. The careful execution that had before been confined to the industrial arts was applied to the decoration of buildings; color and relief sculpture embellished architecture. It is true that the pyramids of this period are smaller than those of the earlier dynasties, generally inferior in execution, and built of brick. But the rock-cut and free-standing tombs gave a chance to design façades, porticoes, and columnar interiors. At Abydos is the group of tombs historically most interesting, as this was from the beginning of Egyptian history the most sacred burial-place. Here the usual type is free-standing. Of rock-cut tombs the most famous group is at Beni-Hassan.

But the peculiar merit of this period is the creation of the grand type of *temple architecture* which was followed throughout the rest of Egyptian history. In it the Egyptians approximated closely to the type afterwards followed by the Greeks. This is so in the material element of construction, in quarried blocks finished and laid in regular courses with the utmost care and accuracy. Among the Egyptians, they were sometimes attached by metal clamps or wooden dovetails. Equally Greek was the lavish use of columns supporting architraves. But there is no resemblance in the plan. Aside from a few exceptions, such as the quasi-Greek Temple of Amenophis III. at Elephantine, with its peristyle surrounding a cella, the usual type of Egyptian temple is the following: A road bordered by colossal statues leads to the high-walled inclosure which hides the temple. The single imposing gateway is flanked by two tower-like pylons of very massive proportions; through it an open court is reached, surrounded by one or even two rows of columns, making it resemble an atrium. Through a gate in a solid wall the outer part of the sanctuary proper is reached, the hypostyle hall, divided into three aisles crosswise by rows of columns, and lighted from above. Finally comes the inner sanctuary with an isolated shrine in a dark columnar hall, surrounded by small chapels. The effectiveness of this arrangement, with its gradual transition from the brilliant sunlight of the court to the intense gloom of the farthest chapel, is increased by an upward slant of the floor-level and the curving of horizontal lines. This simple scheme was usually complicated by additions made by succeeding monarchs in any great shrine like Karnak or Philæ; court after court, each with its entrance pylons, were strung together or connected by avenues; and independent sanctuaries were placed side by side. The grouping on the island of Philæ is the most picturesque in Egypt. Other important temples are that of Luxor, the Ramesseum, and those at Medinet-Habu, Edfu, Denderah, etc. Edfu is most symmetrical and well preserved, but the group at Karnak is the most monumental and artistic in Egypt, the work of many monarchs of the Middle and New Empires. Its hypostyle hall, 50 × 100 meters, had a central nave with twelve of the highest columns ever used in Egypt, and aisles formed of 122 columns in nine rows. The capitals were of many orders. In this hypostyle hall the bell shape was used in the centre, the lotus in the aisles, the proto-Doric plinth with sixteen-sided columns was used there in the colonnade of Thothmes III. Many floral designs, like the palm, were used to vary the bell capital, and a similar variety of design appears in the lotus capital, which bears sometimes a clustered bundle of the stalks, sometimes the flower. Finally, the late so-called Athor capital was decorated with female heads on each side.

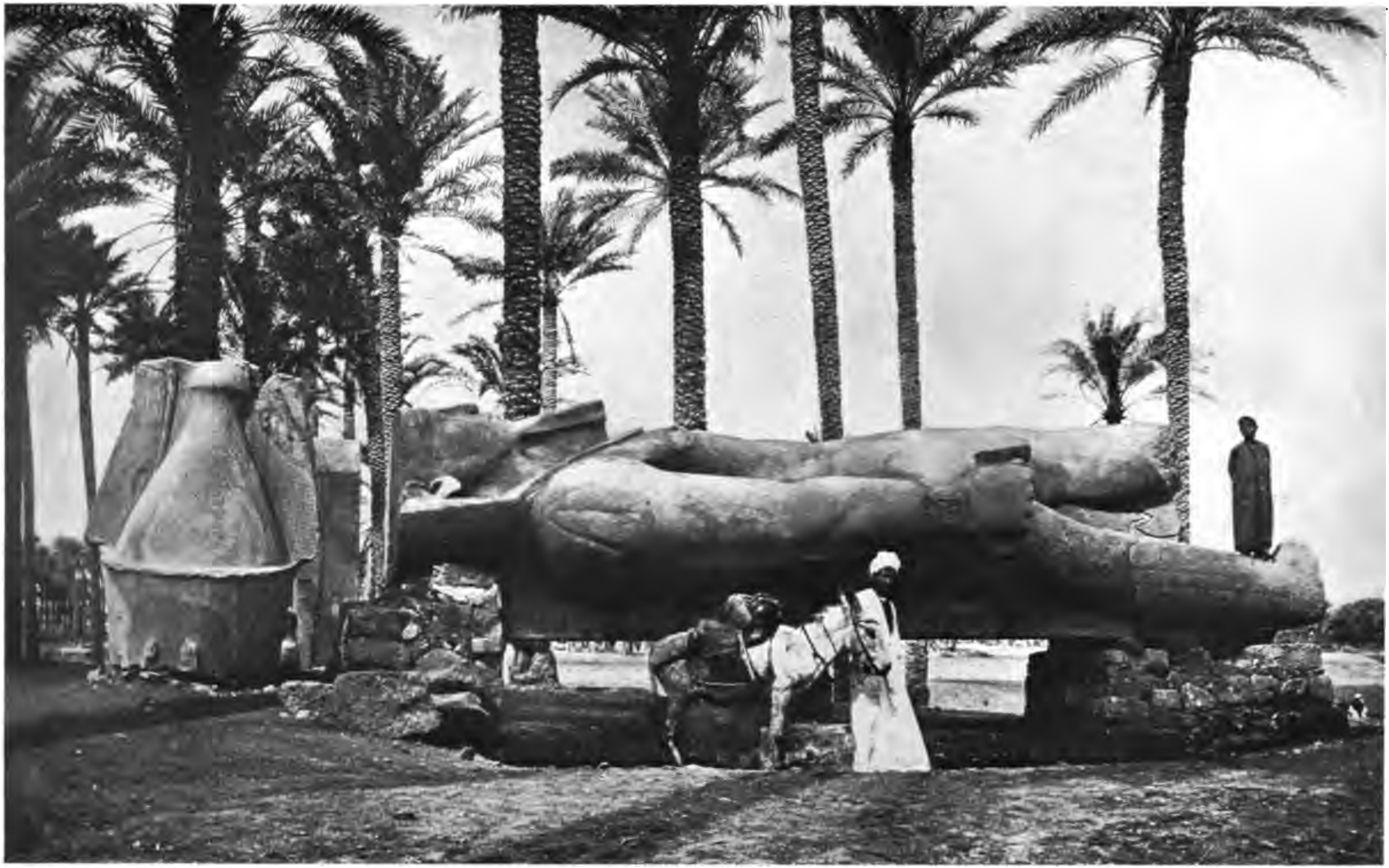
Besides these types of capitals, there was little design of an architectural character. The walls of every building, sloping inward as they rose, and thus giving a pyramidal effect to the structure, were crowned by a cavetto cornice; below it and around the openings and down the angles the clustered torus is used. No other moldings, no other cornice, no other details appear. On the other hand, the surface decoration was wonderfully full and varied. The columns were covered with designs and so was every inch of the walls. The favorite form was that of extremely low relief or incised sculpture, brilliantly colored, and arranged in systematic series of panoramic pictures, according to an elaborate mythological or historic system.

In this development of temple architecture we can only divine the share taken by the Middle Empire (Eleventh and Twelfth dynasties), because only fragments remain of this age, at Bubastis, Karnak, etc. It was the great kings of the New Empire, the Thothmes, Amenhoteps, Setis, and Rameses, the conquerors of the East, who were the greatest builders; and after them no revival comes until the Ptolemaic age. There were two classes of temples of different type, both of them connected with tomb architecture. One series is that of the rock-cut temples with sculptured façades, of which the most famous are at Abu Simbel (q.v.), the work of Rameses II., their façades decorated with colossal statues, and their halls an imitation of the free-standing temples. Then come the royal tombs of the New Empire, dug deep into the mountain, as at Bab-el-Moluk, and the corresponding sepulchral temples. Of these the greatest is that of Queen Hatasu at Deir-el-Bahari, uniquely picturesque and new in type, partly excavated and partly built. Others approach more the usual type, as the Ramesseum, not far from it, and the Temple of Rameses III. at Medinet Habu.

A great deal more of the civil and military architecture of Egypt has been preserved than in any other ancient civilization until late Hellenic times. At Thebes, Memphis, Bubastis, and many other cities, whole quarters remain; and the fortresses of Abydos, El-Kab, and Semneh, though of early date, are in excellent preservation, as are also the fortified walls of many cities, such as Sân, Saïs, and Thebes. The New Empire at once adopted the Asiatic type of fortifications with which its wars had familiarized it, and substituted stone for bricks. In all private houses of any size the inner court and the flat roof were prominent features. The largest were hidden away in a garden or park, surrounded by high walls, and, besides the main residence, had many subordinate buildings, often as complete as those of a mediæval monastery.

Sculpture. While it seems probable that Babylonian architecture produced works of monumental importance at a much earlier date than did the architecture of Egypt, it was quite the reverse with sculpture. The religious beliefs of the Egyptians led their early artists carefully to observe and copy the human figure in order to reproduce accurately each individual after death, so that the spirit and soul, the *ba* and the *ka*, should recognize their earthly tenement and be reunited to it. Consequently the best early Babylonian sculptures (those of Tello) seem lifeless and hard compared with the early Egyptian statuary. The sculptors were extremely prolific. The greatest collection is, of course, in the museum at Ghizeh; others of first importance are those of the Louvre, the British Museum, the Vatican, Florence, Turin, The Hague, and Berlin. A large proportion, however, of the works remain *in situ*, in the temples and tombs, both colossal statuary and series of reliefs, especially in the temples of Abydos, Edfu, Ipsambul, Philæ, and Thebes, and in the tombs at and near Beni-Hassan, Memphis, and Thebes.

All the sculptures of the Old Empire have been found in tombs and have some funerary connection or significance. They are far more realistic than later works, and often have considerable value as portraits. The colossal and official style does not arise until the Middle Empire in connection with temple architecture, reaching its climax under the Rameses and Setis of the New Empire. From the beginning plastic art was used to illustrate the daily life of the people. Each tomb contained a faithful detailed representation of the possessions, occupations, person, and family of the deceased, as well as scenes of his future life. In the inner chamber were several statues as he or she appeared in life; in the chamber of offerings were other statues, the table of offerings, and especially a series of scenes in low relief, usually colored quite brilliantly on a stucco ground, not shaded, but laid on in broad masses and with strong contrasts. In the New Empire two other forms besides the low relief became popular—sunken relief (*cavo-relievo*) and outline relief (*stiacciato*)—with the result of making sculpture even more pictorial in effect. There was never much work done in high relief, and that was nearly all during the Old Empire. The methods of quarrying, transporting, blocking out, carving, finishing, and polishing sculptures, whether in relief or in the round, are among the scenes represented. It is interesting that the Greek tradition of the use of wood by Egyptian sculptors in the earliest times should be borne out by the discovery of a number of wooden statues of the Old Empire, chief of which is the famous standing figure of an official nicknamed the *Sheik-el-beled* (Ghizeh Museum). Acacia and sycamore were among the woods used; apparently a sacred significance was attached to this material, as, later, among the Greeks. Basalt, diorite, and red granite were the favorite stones for statuary, while reliefs were mostly in softer varieties, as limestone and sandstone. At a late



EGYPTIAN ART

COLOSSAL STATUE OF RAMESES II., FOUND NEAR MEMPHIS

period red porphyry became popular. Many of the ancient quarries have been rediscovered. The element of color seems to have been considered necessary in sculpture; when it was not given by the stone itself—as in basalt, diorite, and red granite—it was obtained by stuccoing and painting the softer stones, and even wood. The methods of representation were purely conventional, and for the purpose of conveying an idea, not of producing an illusion (except in the case of the portrait statues of deceased persons). The main attempt was to show as much as possible to the beholder. Therefore in relief, figures were spread out as on a map: the head in profile (but the eye in front view), the shoulders full front, the arms and hands in profile, the trunk three-quarters, the legs and feet in profile. In scenes where several planes of figures are given, there is no attempt at perspective, but the rows are raised, one above the other, toward the background. In a garden the plants and trees are stacked horizontally on both sides; around a pond, on all four sides. In such cases nothing stands upright. Egyptian sculptors, undaunted by inability to reproduce scenes realistically, were prodigal with details. This inability does not become apparent in the simpler processional or other scenes, where only one plane is required, as in most Assyrian and all Greek reliefs. In such details the execution is surprisingly delicate and highly finished.

From the beginning there seem to have been two styles in sculpture: the hieratico-religious and the secular. The former was stiff, traditional, and with few types; the latter was easier, freer, and with much greater variety. The famous colossal statue of King Khafra, with hands on knees, in the familiar traditional attitude, shows also the type of slender body used for gods and kings, in contrast to the heavy, squat type—like that of the Coptic fellah—used for portraits of common folk, such as the above-mentioned *Sheik-el-beled.* Outside of any class, and the earliest large work of sculpture, is the colossal Sphinx of Ghizeh, which is now disintegrating under the changed climate. The favorite theme of the naturalistic portrait is perhaps the seated group of husband and wife, a theme in which truth to nature lasts even through the Middle Empire, as shown, for instance, in the group of Ra-Hotep and Nefert, of the Thirteenth Dynasty, where the husband is of the negroid type so common before the New Empire. Outside of Egypt, the Florence Museum is particularly rich in these family groups. There are a few cases of *genre* and other scenes which are also particularly naturalistic, such as the "Royal Scribe," at the Louvre, and the "Girl on Her Knees Washing Clothes." The representations of divinities are very material, without being natural. They were usually of a composite human-animal type, reminiscent of totemism and fetichism: Sekhet-Bast, a lion or cat; Anubis, a jackal; Horus, a hawk; Chnum, a ram; Thoth, an ibis; Lebek, a crocodile. Usually the method was to place an animal's head on a human body, though sometimes the god was wholly human and accompanied by his animal emblem. Figures of the gods were multiplied innumerably on a small scale. The gods of Upper and of Lower Egypt were worshiped on the opposite walls of a temple, and the god's image, receiving the worship of the King, was repeated many hundreds of times in relief on the walls and columns, and even on the surfaces of the outer pylons. This was especially the case in later art. Bronze, glazed porcelains, and other statuettes of the gods were manufactured by the million as objects of devotion, according to uniform types. This religious side of Egyptian sculpture is perhaps the least interesting, and that in which the artist was allowed the least change. The next class is that of official political art. Here also there is a traditional element. The scene of the colossal King, at whose feet cower a group of captives whom he is about to slaughter, is repeated without variation during many reigns. So is the scene of the victorious King in his chariot overturning his enemies, as sung of Rameses II. in the famous poem of Pentaur. But even this political art had its realistic and free side. At Karnak the low reliefs, representing the captives defiling with their gifts, offer a splendid and rich series of types of the different races and tribes inhabiting Syria, Phœnicia, and Palestine, the artists having succeeded in conveying racial traits with very few touches. In the same way the processional reliefs of Queen Hatasu at Deir-el-Bahari are very illustrative of the products and races of the south. But of even more varied interest are the reliefs and paintings in the tombs of private persons. In one of the tombs of the Middle Empire a scene represents the migration of a tribe in patriarchal fashion, in all its details, showing how traveling was done in the age of Moses. There was a distinct phase of naturalistic revival under Amenophis IV. (Akhunaten) in the New Empire; otherwise the change was toward the stiff, the colossal, and the highly finished. Under the late Saitic Dynasty there was a revival in the reign of Psammetichus, with a recurrence to the grace and delicacy of the time of Seti I. and Rameses II. Then, when Greek art was introduced under the Ptolemies, sculpture was more affected than architecture.

Painting and Minor Arts. Painting in Egypt can hardly be called an independent art. It was largely an adjunct to sculpture and architecture, making of all Egyptian art a mass of color. In the tombs, however, especially during the Fifth and Sixth, the Eleventh, Twelfth, and Thirteenth dynasties, wall paintings were as popular as reliefs, had the same characteristics, and portrayed the same themes. The minor arts always flourished. They may, in fact, be said to have been the earliest to develop. Egyptian gold and enamel jewelry, with its rich necklaces and pectorals, was thought to have developed in the New Empire; but M. de Morgan's discoveries of royal jewelry of the Middle Empire, of fully as great beauty, put back its origin, and afterwards some fine jewelry of the early part of the Old Empire was found. The Egyptians applied artistic design and decoration very successfully to articles of furniture, ornament, and domestic use; to chairs, beds, mirrors, boxes, spoons, etc.; and their artisans used wood, ivory, and the various metals with almost equal ease. These works were distributed throughout the Mediterranean basin by Phœnicians and Greeks, and so influenced the general history of design even more than the more monumental works.

Bibliography. Consult Maspero, ***Manual of Egyptian Archæology*** (Eng. trans., London,

1895), and Petrie, *History of Egypt*, 3 vols. (London, 1899-1905). The latest Egyptian manual is Breasted, *A History of Egypt from the Earliest Time to the Persian Conquest* (New York, 1905). The fullest history is Perrot and Chipiez, *Histoire de l'art dans l'Antiquité*, vol. i., *Egypt* (Paris, 1882), translated by Armstrong (London, 1883). Large series of monuments are published in such illustrated works as Prisse d'Avennes, *Histoire de l'art égyptien* (Paris, 1878-79); Lepsius, *Denkmäler aus Aegypten und Aethiopien* (Berlin, 1849-59). The relation of the plastic and minor arts to life is well given in Wilkinson, *The Manners and Customs of the Ancient Egyptians* (London, 1837-41). Capart, *Primitive Art in Egypt* (Philadelphia, 1905) is a discussion of the early art of Egypt. The finest monographs on a large scale are those published by the Egypt Exploration Fund and the Mission Archéologique Française du Caire. See also OBELISK; PYRAMID; TEMPLE; TOMB; also under ABU-SIMBEL; ABYDOS; BENI HASSAN; BUBASTIS; KARNAK; LUXOR; MEMPHIS; PHILÆ; THEBES.

EGYPTIAN BEAN. See NELUMBO.

EGYPTIAN CAT, or CAFFRE CAT. A wild cat of the Nile region, domesticated in ancient Egypt. See CAT.

EGYPTIAN EXPLORATION FUND. A foundation promoted in 1882 by the Egyptologist Amelia B. Edwards (q.v.), for the excavation and study of Egyptian remains. Under its auspices Edouard Naville unearthed Goshen and the Temple of Bubastis; W. M. F. Petrie disclosed Naucratis and discovered fragments of the works of Euripides, Plato and other writers; and E. A. Gardner made important finds of pottery. An American branch was founded in 1883 by W. C. Winslow (q.v.), which rendered invaluable service in the prosecution of the work.

EGYPTIAN MUSIC. The information which we possess about Egyptian music is extremely meagre. It is derived either from inadequate accounts of ancient Greek authors, or from illustrations and specimens of their musical instruments. We do, however, know that music, crude and imperfect as their form of it was, has played an important rôle from before the time of the Old Empire down to the songs of the Nile boatmen of to-day. They sang odes to the gods, songs in praise of their heroes, dirges to the dead, and their entertainments were considered incomplete without musicians and dancers.

Probably, as in the case of every nation which has developed from barbarism to civilization, the first music was merely an accompaniment to the dance. Some of the earliest representations show singers clapping their hands in rhythm to the motions of dancers, and this method of marking time is used at the present day. During the Old Empire the dances were generally slow and dignified, and the accompaniment was that of voices; but with the beginning of the New Empire the *tempo* of the dances became rapid and the usual accompaniment was supplied by tambourines and castanets. The pirouette was a favorite dance, and in that, as in all their complicated figures, the use and position of the hands and the arms was of prime importance. The number of performers varied from one or two to ten or fifteen; though, as the dramatic ballet was unknown, their more elaborate dances consisted rather of a number of small groups than of one integral whole.

Vocal music consisted of solos and choruses, which seem to have been entirely in unison. Women often sang without instrumental accompaniments, but the Egyptians seem to have felt that the voices of men needed the support of instruments. Many of the very ancient songs have been preserved in hieroglyphics, and though they are inferior to the Hebrew, they are remarkable for striking metaphors and naturalness of expression. Most famous, and one of the oldest of the songs, is that of the oxen treading out the corn. Various theories were formerly advanced to show that the Greeks derived their knowledge of music from the Egyptians; but though the latter had treatises on music, they seem to have had no system of notation and no definite ideas of harmony. Indeed, it is without parallel that a people so advanced in other arts as were the Egyptians should have had so little exact knowledge of the science of music. We have no definite information about their scales, though the seven-stringed lyre seems to have been tuned in conjoined tetrachords.

Long before the lyre was known to the Greeks the Egyptians had both harps and lyres. The harp was their earliest instrument, and we have records of it before B.C. 3000. In its original form it had five or seven strings, and was extremely long (certainly over six feet), with a semicircular body. As it was developed, however, the number of strings was increased to eleven or twelve, and, by B.C. 1300, to twenty-one, while its size was greatly reduced. At no time, however, did the Egyptians have pedals, or even, as in the Welsh harps, a double set of strings; consequently, unless retuned, they could be played but in one key. The ornamentation of harps was most elaborate, the heads and bodies being exquisitely carved and painted. Although the harp always remained a national instrument, its popularity was eclipsed later by the lyre, the Egyptian form of which had from six to twenty strings, and was considerably larger than its Grecian derivative. At a very early time flutes were in use. The long flute was held in a slanting, perpendicular position, and the short flute in a horizontal. The number of apertures varied from three to five. Considerably later the double flute superseded the other two. It was played with both hands, one tube giving the melody while the other droned a monotone accompaniment.

By B.C. 400 or 500, in addition to the various forms of harp, lyre, and double flute, there were the *te-bouni* (a sort of banjo), the shoulder harp, and several kinds of drums. The *te-bouni* had a long neck and a cylindrical body over which parchment was stretched. It sometimes had two or three strings, but generally only one, and in subsequent centuries the monochord (q.v.) was developed from it. The shoulder harp was a link between the harp and guitar. A specimen preserved in the British Museum has a neck 22 inches long, a body 19 inches long and 4 inches wide, and 4 strings. As its name implies, it is played when resting on the shoulder. There were two common forms of drums, the larger one being a barrel-shaped instrument about three feet long, and the smaller a cone-shaped earthenware vessel over the open end of which parchment was stretched. Still later were added the *sistrum*, a sort of rattle, and the *trigonon*, a triangularly shaped stringed instrument; the *tamboura*, a form of lute, sometimes provided with frets, and played with a plectrum; and the tambourine. Besides the principal instruments already enumerated, there were at different times numbers of derived instruments, varying slightly in form from their prototypes. The musical instruments used in war were trumpets, cymbals, and drums. In earliest times the musicians were generally men, but later women took their places, although there were always certain instruments which seem to have been the peculiar property of each sex. The patron gods of music and the dance were Athor, the Egyptian Aphrodite, and Bes, the dwarf god.

The modern musical instruments of the Egyptians are practically those of the Arabians. (See Arabian Music.) The study of music is not pursued, but that there is a natural love of it is shown by the songs of the country folk, laborers, and boatmen at their work. The Nile sailors are particularly famous for their songs, of which there is a considerable variety, many of them having been handed down from generation to generation for centuries.

For a general sketch of Egyptian music, consult: Mathews, *A Popular History of the Art of Music* (Chicago, 1894); for more elaborate treatises, Engel, *Music of the Ancients* (London, 1864); Wilkinson, *The Ancient Egyptians*, vol. i. (London, 1879); and for examples of modern Egyptian songs, MacGregor, *Eastern Music* (London, n. d.).

EGYPTIAN PAPER PLANT. See Cyperus; Papyrus.

EGYPTIAN QUESTION, The. See Egypt.

EGYPTIAN RICE CORN. See Sorghum, paragraph *Non-saccharine.*

EGYPTIANS, Gospel of. See Apocrypha, section *New Testament.*

EGYPTIAN SUDAN. That part of Northeast Africa, under Anglo-Egyptian control, lying south of Egypt, with its northern limit at the twenty-second parallel of latitude, and bounded on the east by the Red Sea, Eritrea, and Abyssinia, on the southeast by British East Africa, on the south by German East Africa and the Congo Free State, and on the west by French Congo, Wadai, and the Sahara, the western and eastern limits not being as yet fixed (Map: Africa, H 3). The total area is given as approximately 950,000 square miles. The distance from the Egyptian boundary to the Albert Nyanza is 1400 miles. In the north lies the Nubian Desert, and across the central section and in the extreme south are found mountains. In the flat part of the southern region are pestilential swamps. In this section the rainfall is enormous, being from 80 to 100 inches a year. There are only two dry months—November and December. The precipitation gradually diminishes northward, and represents about an average fall at the northern boundary of the country. The Nile, with its important headstreams, courses through the entire land from the Albert Nyanza to Egypt. All the tributaries of the Nile enter it in Egyptian Sudan, the last one north being the Atbara, coming from the east. For 236 miles the Upper Nile, from Bor to the mouth of the Bahr-el-Ghazal, has a very feeble slope, and flows slowly through many channels which are often obstructed by masses of matter and decaying vegetation (the sudd), which must be cut through and kept moving in order to secure a navigable channel. Below the Bahr-el-Ghazal the river is known as the White Nile as far as Khartum, where it is joined by the Blue Nile from the east. Five of the Nile cataracts are located between Khartum and the northern boundary. (See Nile.) The Atbara is heavily charged with volcanic débris from the Abyssinian highlands, and supplies the greater part of the mud which gives fertility to Lower Egypt. Egyptian Sudan is largely underlain by igneous and metamorphic rocks. Of these materials are composed most of the ranges and ridges traversing this region. To the northwestward the formations become successively younger in geologic age. The country is not only well watered, but the extremes of temperature are not excessive, though the mean temperature is high. But agriculture suffered greatly since the revolt of the Mahdi in 1883, and trade has been largely abandoned. In December, 1889, the territory was reopened for trade, and the important traffic of former times in ivory, ostrich-feathers, gold-dust, gums, and skins is being revived. The opening in January, 1906, of the Berber-Suakim railway, a distance of over 200 miles, will be of the utmost advantage to the Sudan, as it gives it a short route to the sea. In the south particularly there are great natural resources. The soil along the White Nile is rich, and millet, durra, and sesame are raised. The forests are extensive, and possess numerous valuable varieties of wood.

According to the terms of a convention signed in 1899 by the British and Egyptian Governments, and providing for an Anglo-Egyptian condominium, there is a Governor-General, appointed by the latter Government with the consent of the former; laws are made by proclamation; no duties are put on imports from Egypt; and duties on imports from other countries must not exceed those levied in Egypt. The region is divided into twelve provinces—Khartum, Dongola, Berber, Kassala, Sennar, Kordofan, Blue Nile, White Nile, Bahr el Ghazal, Halfa, Suakim, and Upper Nile. For 1905 the receipts were estimated at £E535,883, the expenditures £E915,646. There are no figures for the population. It was given as 10,000,000 before 1882, but fully four-fifths of the inhabitants are thought to have perished during the Dervish rule. Karthum (q.v.) is the capital, and is connected with Cairo by rail and telegraph. Other chief towns are Omdurman, Dongola, Wadi Halfa, Berber, Kassala, El-Obeid, and Suakim.

EGYPTIAN VERSIONS. See Bible.

EGYPTIAN WATER-LILY. See Lotus.

EGYPTOLOGY. The study of the language, history, and antiquities of ancient Egypt. One who engages in such studies is termed an Egyptologist. As early as the sixteenth century the monuments of Egypt began to attract the attention of European scholars, and between 1529 and 1589 some ineffectual attempts were made to decipher the Egyptian hieroglyphics. In the following century the subject was revived by the learned Jesuit, Father Athanasius Kircher, one of the foremost scholars of his time, whose astonishing activity and versatility were exhibited in many fields of research. Kircher proceeded upon the mistaken theory that the hieroglyphic writing was a sort of symbolism for conveying abstruse religious mysteries, the individual characters being purely ideographic symbols. His efforts were therefore not more successful than those of his predecessors, and his fantastic renderings of hieroglyphic texts are among the most remarkable curiosities of Egyptological literature. But though he failed in his main object, his works did much to excite an interest in Egyptian antiquities, and he also rendered valuable service by introducing the study of Coptic into Europe. His Coptic grammar, entitled *Lingua Ægyptiaca Restituta* (Rome, 1643-44), was the first published by a European scholar, and for a long time formed the basis of all work done in this field. Kircher was followed by Lacroze, Wilkens, Mingarelli, Quatremère, Zoëga, Jablonski, and many others, who did much to develop the study of Coptic and of Egyptian antiquities, and thus prepared the way for further progress. Down to the end of the eighteenth century hardly any progress was made in the decipherment of the hieroglyphics. Kircher's theory was, however, gradually discredited, and the belief gained ground that the hieroglyphic inscriptions were composed in the language actually spoken by the ancient Egyptians, and that they dealt with history, science, art, and other subjects of a more material character than religious mysteries. Professor Tychsen (1734-1815), of Rostock, was led by careful analysis of many texts to the correct conclusion that certain characters served merely to determine the meaning of words (see HIEROGLYPHICS); and the learned Coptic scholar Zoëga (1755-1809) was the first to point out that some of the characters at least had purely phonetic values, and that the groups of signs inclosed in oval rings must represent the names of kings. This, however, was practically all that was known in regard to the subject, and many fanciful theories still prevailed. The means of solving the riddle was at length furnished by the famous Rosetta stone (q.v.), discovered in 1799, which contains a decree of the Egyptian priests in favor of Ptolemy V., Epiphanes (B.C. 205-181), composed in Greek with two parallel versions—one in the vernacular, written in the Demotic character, and another in the classical language of ancient Egypt, written in hieroglyphics. The upper part of the hieroglyphic text was broken away, only the last fourteen lines remaining; while the Greek and Demotic texts were nearly complete, and for this reason the Demotic portion was selected for the first attempts at decipherment. The distinguished French Orientalist, Baron Sylvestre de Sacy (1758-1838), by careful comparison of the Greek and Demotic texts, was able to distinguish in the latter several of the proper names occurring in the decree, and in his *Lettre au Citoyen Chaptal sur l'inscription égyptienne du monument trouvé à Rosetta* (Paris, 1802) pointed out the Demotic groups corresponding to the names of Ptolemy, Berenice, and Alexander. This achievement was, however, surpassed by the Swedish scholar, J. D. Akerblad (1763-1819), who established the phonetic values of nearly all the Demotic characters occurring in the proper names, and also by the aid of Coptic determined the meaning of several words of the text. His results were published in his *Lettre sur l'inscription égyptienne de Rossette adressée au Citoyen S. de Sacy* (Paris, 1802). Following these investigators, the English physicist, Dr. Thomas Young (1773-1829), was able, through careful study of many Egyptian inscriptions and papyrus rolls to distinguish between the Hieratic and the Demotic scripts, and to determine the meaning of a number of groups of characters, although ignorant of their phonetic values. Utilizing Zoëga's conjecture that the groups of signs in oval rings were royal names, Young next pointed out the hieroglyphics equivalent for the name of Ptolemy in the Rosetta text, and attempted to analyze it. The name is written with seven alphabetical characters (Ptolmis), and three of them (P, t, and i) Young determined correctly. Of the remaining four, he took the letter *o* for a silent determinative, and explained the letters *l*, *m*, and *s* as syllabic signs, reading them as *ole*, *ma*, and *os* respectively. He also recognized the name Berenice in a hieroglyphic inscription from Karnak, but in it he correctly determined but one additional character, the letter *n*. In his attempts to decipher other hieroglyphic names he was completely unsuccessful, and thus the sum of his achievements in hieroglyphic decipherment was the determination of four alphabetic characters. While to Young belongs the credit of being the first to assign correct phonetic values to a few hieroglyphic signs, the true credit for the decipherment of the Egyptian hieroglyphics and for the foundation of modern Egyptology belongs to Jean François Champollion (q.v.). Born at Grenoble in 1790, he early applied himself to the study of Egyptian antiquities, was a master of Coptic, and at the age of twenty-four was known as the author of an important work on the history and civilization of ancient Egypt—*L'Egypte sous les Pharaons* (2 vols., Paris, 1811-14). In his investigations of the hieroglyphics Champollion, unlike Young, worked upon the theory that the characters used for writing royal proper names were purely alphabetic. On a small obelisk from Philæ, containing parallel hieroglyphic and Greek inscriptions, he read and correctly analyzed the names of Ptolemy and Cleopatra, and by substituting the phonetic values thus obtained in a large number of other hieroglyphically written names, he was able at once to control his results and to extend his system. In this way he was soon able to make out all the alphabetic characters, and to read the names, not only of Ptolemaic kings and of Roman emperors, but also of the Pharaohs of the Old Empire. In the course of subsequent investigations he discovered the use of the ideograms and determinatives, and surmised at least the phonetic employment of the syllabic signs. He published an outline of his system in his celebrated *Lettres à M. Dacier relatives à l'alphabet des hiéroglyphes phonétiques employé par les Egyptiens* (Paris, 1822), and developed it more fully in his *Précis du système hiéroglyphique des anciens Egyptiens* (Paris, 1824; 2d ed. 1827-28). Until his death Champollion devoted himself with wonderful energy and success to the elucidation of the language, history, religion, and antiquities of ancient Egypt, and left, in addition to his published works, a large mass of manuscript. His *Grammaire égyptienne* (Paris, 1836-41) and his *Dictionnaire égyptien* (Paris, 1841-46) were not published until after his death.

Champollion's results were not received without reserve. Among the chief opponents of his system were Spohn and Seyffarth, both professors at Leipzig. Seyffarth, who developed the system of Spohn, held the erroneous theory that the hieroglyphic characters were, with scarcely any exception, purely phonetic, and he even read the determinatives (see HIEROGLYPHICS) as separate words. His system thus formed the opposite extreme to that of Kircher, and his translations are almost as fantastic as those of his seventeenth-century predecessor. Seyffarth did much to retard the progress of Egyptology, but his system was finally discredited.

Of a very different character was the work of the distinguished German scholar, Karl Richard Lepsius (q.v.). In his *Lettre à M. Rosellini sur l'alphabet hiéroglyphique* (Rome, 1837), Lepsius submitted Champollion's system to a searching criticism, and while clearly proving its general correctness, he indicated a number of points in which revision was necessary. From 1842 to 1845 he headed the archæological expedition sent out by King Friedrich Wilhelm of Prussia to explore Egypt and Nubia. The results of the expedition were published under Lepsius's editorial supervision in the magnificent *Denkmäler aus Aegypten und Aethiopien* (6 vols., Berlin, 1849-58), which contains careful drawings and architectural plans of all the principal monuments of Egypt accessible at that time, as well as a remarkably extensive collection of inscriptions dating from all periods of Egyptian history. This great work is one of the chief monuments of modern Egyptology. In 1866 Lepsius had the good fortune to find at Tanis the celebrated *Decree of Canopus*, issued by the Egyptian priests in favor of Ptolemy III., Euergetes, and dating from the year B.C. 238. The inscription is trilingual, and the Greek, Demotic, and hieroglyphic portions are all in an excellent state of preservation. A duplicate of it, found at Damanhûr in 1881, was published by Pierret under the title *Le décret trilingue de Canope* (Paris, 1881).

The first Egyptologist who really translated complete texts was the French academician, Vicomte Emmanuel de Rougé (died 1872). Applying strict philological methods, he pointed out in his *Mémoire sur l'inscription d'Ahmes* (Paris, 1851), in his *Etude sur une stèle égyptienne de la bibliothèque impériale* (Paris, 1856-59), and in other works the manner in which Egyptian texts should be interpreted and explained, and his *Chrestomathie égyptienne* (Paris, 1867-76) completely revolutionized the treatment of Egyptian grammar. In the explanation of hieratic texts, hitherto much neglected, he was also successful, and in 1856 he read before the Institute of France a translation of nearly the whole of the poem celebrating the exploits of Rameses II. in his war with the Hittites. In this special department of Egyptology he was, however, surpassed by his compatriot, François Joseph Chabas, whose *Le papyrus magique Harris* (Châlon-sur-Saône, 1860) and *Voyage d'un égyptien en Syrie, en Phénice, en Palestine,* etc. (Paris, 1866)—the latter published in collaboration with the English Egyptologist, W. Goodwin—may be said to have placed the study of hieratic texts upon solid grounds.

The study of Demotic texts, neglected after the death of Champollion, was revived by Heinrich Brugsch (q.v.), whose *Grammaire démotique* (Paris, 1855) formed the basis of subsequent work in this field. In more recent years, Eugène Revillout (*Chrestomathie démotique,* Paris, 1870-80; *Nouvelle Chrestomathie démotique,* Paris, 1878) and J. J. Hess (*Der demotische Roman von Stne Ha-m-us,* Leipzig, 1888; *Der gnostische Papyrus von London,* Freiburg, 1892) deserve mention as specialists in Demotic. Among the many important works of Brugsch, however, the chief place must be assigned to his *Hieroglyphisch-demotisches Wörterbuch* (7 vols., Leipzig, 1867-82). The influence of this great thesaurus of the language upon the development of Egyptological knowledge has been important in the highest degree. Pierret's *Vocabulaire hiéroglyphique* (Paris, 1875) is merely an abridgment of Brugsch's great work. Levi's *Vocabolario geroglifico-copto-ebraico* (Turin, 1887-89) has contributed little to the advancement of Egyptian lexicography. A new and comprehensive Egyptian dictionary was in 1902 in course of preparation in Germany, under the direction of Prof. Adolf Erman, of Berlin, but he did not expect that it would be ready for the press for several years. Professor Erman has the distinction of having inaugurated the historical method in the study of Egyptian grammar. It was he who first accurately defined the characteristic features of the several periods of the language, and treated the three earliest stages in his works: *Neuägyptische Grammatik* (Leipzig, 1880); *Die Sprache des Papyrus Westcar* (Göttingen, 1889); and *Aegyptische Grammatik* (Berlin, 1894). See EGYPT, section *Language.*

That Coptic studies have kept pace with other branches of Egyptology is due to the labors of scholars like Peyron, Schwartze, Tattam, Stern, de Lagarde, Amélineau, Hyvernat, and Steindorff.

ARCHÆOLOGICAL EXPLORATION IN EGYPT. Archæological research has been carried on in Egypt, with some intermissions, for over a century. In 1798 the Emperor Napoleon took with him to Egypt a scientific commission to explore the monuments of the country, and the results of their investigations are published in the splendid work, *Description de l'Egypte* (Paris, 1809-29), comprising ten volumes of text and fourteen volumes of plates. The work of the commission sent out by King Frederick William of Prussia, which resulted in the publication of the famous *Denkmäler,* has been mentioned above. Important collections of texts and memoirs of travel have also been published from time to time by individual explorers. For the past fifty years both the French and the Egyptian governments have actively fostered the advance of Egyptological studies, and since 1880 the former Government has maintained at Cairo a permanent mission (founded by Maspero) for the prosecution of archæological investigations and for training promising students in advanced work. The mission has published a valuable series of memoirs, containing a large number of texts dating from various historical periods, *Mémoires publiées par les membres de la mission archéologique française au Caire* (Paris, 1884 et seq.). The work of the Anglo-American Society, the Egyptian Exploration Fund, founded by Miss Amelia B. Edwards in 1882, has been very fruitful. Many ancient sites have been explored, and many interesting discoveries have been made. Up to the present time the society has published more than thirty valuable memoirs, and its annual reports give a comprehensive survey of the progress of Egyptology throughout the world.

A very large number of Egyptian inscriptions and papyri have been published by the different museums and by individual scholars. In this direction, as also in other ways, important service has been rendered by a number of periodicals devoted wholly or in part to the interests of Egyptology. *Zeitschrift für ägyptische Sprache und Alterthumskunde* (Leipzig, 1863 et seq.), *Recueil de Travaux relatifs à la philologie et à l'archéologie égyptiennes et assyriennes* (Paris, 1870 et seq.), and *Transactions* (1872 et seq.) and *Proceedings of the Society of Biblical Archæology* (London, 1878 et seq.), deserve special mention in this connection. The *Revue égyptologique* (Paris, 1880 et seq.) deals more especially with Demotic subjects.

Since the time of Champollion, Egyptology has advanced with steady progress, and to-day stands upon a firm scientific basis. For the past half century hardly a year has passed unmarked by some important discovery. Among the many scholars to whose labors these great results are due, it is difficult to particularize; but the names of Mariette, Dévéria, Pierret, Maspero, de Morgan, Grébaut, and Bouriant, in France; of Hinks, Birch, Le Page Renouf, Wilkinson, Goodwin, Griffith, Flinders Petrie, Newberry, and Budge, in England; of Dümichen, Ebers, Eisenlohr, Wiedemann, Steindorff, Sethe, von Bergman, and Spiegelberg, in Germany; of von Lemm and Golenischeff, in Russia; of Leemans and Pleyte, in Holland; of Rossi, Schiaparelli, and Guidi, in Italy; and of the Swiss scholar Naville, may be mentioned without fear of invidious distinction. The literature of the subject in its various departments is most extensive, and it is unfortunate that no complete bibliography exists. Jolowicz, *Bibliotheca Ægyptiaca* (Leipzig, 1858-61), and Prince Ibrahim Hilmy, *The Literature of Egypt and the Soudan, from the Earliest Times to the Year 1885, Inclusive* (London, 1886-88), bring the subject down to 1885. The numerous Egyptological books and articles that have appeared since then must be sought in the *Orientalische Bibliothek* (Berlin). See Egypt, and the articles on various special subjects alluded to in this article.

EHEBERG, ā′*e*-bĕrk, Karl Theodor (1855—). A German political economist. He was born and educated at Munich, and in 1882 was called to the chair of political economy at Erlangen. A work of considerable value is his *Grundriss der Finanzwissenschaft* (3d ed. 1891), in which the subject of finance is treated in a very thorough and scholarly manner.

EHLERS, ā′lĕrs, Ernst Heinrich (1835—). A German zoölogist. He was born at Lüneburg, and was educated at Göttingen and Munich. In 1869 he was appointed professor of zoölogy at Erlangen, and in 1874 was called to the chair of zoölogy and comparative anatomy at Göttingen. He also became editor with A. von Kölliker, of the *Zeitschrift für Wissenschaftliche Zoologie.* His principal works are: *Zoologische Beiträge*, with W. Keferstein (1861); *Die Borstenwürmer* (1864-68); *Hypophorella Expansa* (1876); *Florida-Anneliden* (1887); and *Zur Kenntnis der Tedicellinen* (1890).

EHLERS, Otto Ehrenfried (1855-95). A German traveler, born in Hamburg. He was educated at Jena, Heidelberg, and Bonn, went to East Africa in 1887, and subsequently visited India, the Andaman and Nicobar Islands, as well as Siam, French Indo-China, Corea, and Japan, returning to Germany by way of the Hawaiian Islands and the United States. His second tour took him through India, Samoa, Kaiser Wilhelms Land, and finally to New Guinea, which country he endeavored to traverse. He was shot by natives accompanying him. His works include: *An indischen Fürstenhöfen* (5th ed. 1898); *Im Sattel durch Indochina* (1894); *Samoa, die Perle der Südsee* (3d ed. 1896); *Im Osten Asiens* (4th ed. 1900).

EHLERS, Rudolf (1834—). A German Protestant theologian. He was born in Hamburg, and was educated at Heidelberg, Berlin, and Göttingen. After holding a pastorate at Stolberg, near Aix-la-Chapelle, he was, in 1864, called to the Protestant Reformed Church at Frankfort-on-the-Main, where he exercised a considerable influence as a theologian, and 14 years afterwards was appointed consistorial councilor. In 1879 he became coeditor of the *Zeitschrift für praktische Theologie.* His works include the following: *Evangelische Predigten* (1873); *Das alte Gesetz und die neue Zeit* (1877); *Bilder aus dem Leben des Apostels Paulus* (1886), and a Latin work on the influence of the ancient philosophies upon the Christian apologists of the second century, for which a prize was awarded by the faculty of Göttingen.

EHNINGER, ān′ĭng-ēr, John Whetton (1827-89). An American painter and etcher, born in New York City. He was a pupil of Couture in Paris, and afterwards studied at Düsseldorf. His paintings include landscape and figure subjects. Among them are: "Peter Stuyvesant" (1850); eight illustrations for Longfellow's *Miles Standish* (1858); and "Twilight from the Bridge of Pau." He was a clever and versatile draughtsman.

EHRENBERG, ā′ren-bĕrk, Christian Gottfried (1795-1876). A German naturalist, born at Delitzsch. He studied at first theology in Leipzig and then medicine and the natural sciences in Berlin. From 1820 to 1826 he traveled extensively in Egypt and Arabia, and afterwards accompanied Alexander von Humboldt to the Ural Mountains and Central Asia. In 1826 he became extraordinary professor of medicine in Berlin, and in 1839 was made full professor. From 1842 he was perpetual secretary of the Academy of Sciences. Among his earlier works are several books of travels; also *Symbolæ Physicæ seu Icones et Descriptiones Mammalium* (1828-33); *Die Korallentiere des Roten Meeres* (1834). His most important works were on infusoria, his investigations of which were epoch-making. His contributions on this subject were: *Organisation Systematik und geographisches Verhältnis der Infusionstierchen* (1830); *Die Infusionstierchen als vollkommene Organismen* (1838): *Fossile Infusorien* (1837); *Mikrogeologie* (1854).

EHRENBREITSTEIN, ā′ren-brīt′stīn. A town and fortress of Rhenish Prussia. It is picturesquely situated on the right bank of the Rhine, directly opposite Coblenz, with which it is connected by a bridge of boats, and a splendid railway bridge. The town of Ehrenbreitstein has several mills, a tobacco manufactory, a flourishing trade in wine, corn, and iron, two cattle markets, and four annual fairs. Population, in 1900, 5303. The fortress of Ehrenbreitstein occupies the summit of a precipitous rock nearly 400 feet above the river, and has been called the Gibraltar of the Rhine, on account of its great natural strength and its massive fortifications. The French attempted to take the stronghold in 1688 and failed, but in 1799, after a siege of fourteen months, they succeeded in capturing it. They retained it only till the Peace of Lunéville (1801), when they retired, blowing up the fortifications behind them. Immediately after the close of the Napoleonic wars, the construction of new fortifications on a vast scale was begun. The scenery around Ehrenbreitstein is the noblest of the whole Rhine country.

EHRENSVÄRD, ā'rens-värd, Augustin, Count (1710-72). A Swedish soldier and military engineer. At the age of twenty-four he invented a device for increasing the force of projectiles. He built the fortifications of Sveaborg (1749), and created the Swedish coast fleet (1756). Owing to the bravery and skill exhibited by him during the Seven Years' War, he was made a field-marshal. In recognition of his services a fine monument was erected to his memory at Sveaborg.

EHRENSVÄRD, Karl August, Count (1745-1800). A Swedish admiral, author, and artist, a son of Count Augustin Ehrensvärd. He became an admiral at the age of thirty-nine, and fought the first naval battle of the Russian War, at Svensksund, but was dismissed because of his retreat. After the death of Gustavus III. he was reappointed to the chief command of the navy (1792), but resigned two years later. The remaining years of his life were devoted entirely to scientific studies, and to the artistic researches which secured for him a high rank as a critic. His principal works are *Resa till Italien* (2d ed. 1819), and *De fria konsters philosophie* (1786), in which he evinces a strong predilection for the classics of Greece and Rome. His collected writings, *Skrifter*, have been frequently reprinted (latest ed. Stockholm, 1866).

EHRLICH, ĕr'lik, Heinrich (1822-99). A German pianist and musical author. He was born in Vienna, and studied under Henselt and Thalberg. He was for some time Court pianist to King George V. of Hanover, and became established in Berlin in 1862, where he was made teacher of the pianoforte at the Stern Conservatory (1864-72 and 1886-98). In addition to musical criticisms and other writings in the *Berliner Tageblatt*, *Die Gegenwart*, and the *Neue Berliner Musikzeitung*, his publications include *Wie uebt man am Klavier* (2d ed. 1884; English translation, New York); *Die Ornamentik in Sebastian Bach's Klavierwerken; Dreissig Jahre Künstlerleben 1862-92* (1893); *Berühmte Pianisten der Gegenwart und Vergangenheit* (1897); *Schlaglichter und Schlagschatten aus der Musikwelt* (1872); *Aus allen Tonarten* (1888); *Die Ornamentik in Beethoven's Sonaten* (1896); *Musik-Aesthetik von Kant bis auf die Gegenwart* (1881); *Modernes Musikleben* (1895). His edition of Tausig's *Technical Studies* is well-known.

E'HUD. The name of one of the judges in Israel before the establishment of the kingdom. The 'judgment' he brought upon a powerful enemy is described in Judges iii. 12-30. Having carried tribute to Eglon (q.v.), King of Moab, he departed, but returned, gained admission on the ground that he had an oracle to present, stabbed the unsuspecting king, and delivered his people. As Ehud occurs in I. Chron. vii. 10, as the name of a clan, and Gera, his reputed father, likewise in I. Chron. viii. 3, the historical character of this hero has been doubted. The desire to celebrate the tribe of Benjamin, and especially the zeal of one of its clans, may have led to the story. Consult: Nöldeke, *Untersuchungen zur Kritik des alten Testaments* (Kiel, 1869); Winckler, *Geschichte Israels* (Leipzig, 1895).

ÉIBAR, ā'ĕ-bär. A town in the Province of Guipúzcoa, Spain, 34 miles by rail east by south of Bilbao. It is noted principally for the manufacture of small arms and metal articles for decorative purposes. Population, in 1900, 6459.

EIBENSTOCK, ī'ben-stŏk. A town in the circle of Zwickau, Saxony, Germany, near the right bank of the Mulde, 17 miles southeast of Zwickau by rail. Its principal edifice is a Romanesque church dating from 1864. It is an industrial centre, the chief seat of the tambour embroidery manufactures, and also has manufactures of chemicals and tobacco. In the vicinity are tin-mines which have been worked since the Twelfth Century. Population, in 1900, 7468; in 1905, 8696.

EICHBERG, ik'bĕrk, Julius (1824-93). A German-American musician. He was born in Düsseldorf, studied composition in Brussels under Fétis, and the violin under Meerts and Bériot, and obtained the first prizes in both subjects at the Conservatory. From 1858 until his death he lived in Boston, where he was director of the Boston Conservatory of Music, general supervisor of musical instruments in the Boston public schools, and head of Eichberg's School for Violin Playing. Among his compositions are: *The Doctor of Alcántara* (1862), which is one of the best operas written in America, and *The Rose of Tyrol* (1865).

EICHENDORFF, ik'en-dôrf, Joseph, Baron von (1788-1857). A distinguished German author, born at Lubowitz (Upper Silesia). He studied at Halle and at Heidelberg, and collaborated with Clemens Brentano (q.v.) and Achim von Arnim on the famous collection of folk-songs, *Des Knaben Wunderhorn*. His early original work included fugitive verse, and a prose tale, *Ahnung und Gegenwart* (1811). From 1813 to 1815 he participated in the War of Liberation, and from 1831 until his resignation in 1845 served as Government councilor in the Prussian Ministry of Public Worship. His poems were the last and probably the most perfect lyric expression of German Romanticism. His later poetic work is generally cast in narrative form (*Julian*, 1853; *Lucius*, 1857), and is tinged with increasing clerical views. His admirable translations from the Spanish, *Der Graf Lucanor* (1845) and *Die geistlichen Schauspiele Calderons* (2 vols., 1846-53), were prompted by the same tendency. His most famous prose work is the familiar *Aus dem Leben eines Taugenichts* (1826), which retains its popularity throughout Germany, as do several of his songs. Mention should also be made of a series of literary critiques, beginning with *Ueber die ethische und religiöse Bedeutung der neuen romantischen Poesie in Deutschland* (1847). A collective edition of his poems appeared in 1841-43 (3d ed. 1883), and a selection of his miscellaneous works in 1867 (5 vols.). Consult the study by Keiter (Cologne, 1887), and Krüger, *Der junge Eichendorff* (Oppeln, 1898).

EICHENS, IK′ens, Friedrich Eduard (1804-77). A German engraver. He was born in Berlin and studied with Buchhorn in that city, and later under Toschi, Forster, and others in France and Italy. His works, which are characterized by careful drawing and elaborate treatment, include examples from Raphael and Domenichino, and numerous portraits of contemporary celebrities (after photographs). His engravings of the mural paintings of Kaulbach in the Neues Museum, Berlin, and of the Shakespeare Gallery of that celebrated artist, are likewise ranked among his best productions.

EICHENS, Philipp Hermann (1812-86). A German-French lithographer, brother of the preceding, born in Berlin and educated at the Berlin Academy, under W. Hensel, and in Paris. From 1839 to 1841 he traveled in Italy and subsequently studied mezzotint engraving in Berlin. His works reveal delicate treatment, careful attention to details, and a thorough mastery of the technique of art. They include "Joconde" (after Leonardo da Vinci); "Shooting at the Target" (Meyerheim); "Return of the Pirate" (Eduard Magnus); and "Hussite Sermon" (Lessing).

EICHHORN, IK′hōrn, Johann Gottfried (1752-1827). A German theologian and Orientalist. He was born at Dörrenzimmern, October 16, 1752, and studied at Göttingen. In 1775 he became professor of Oriental languages at Jena, and in 1788 at Göttingen. Eichhorn's scholarship was very broad and profound, but he is chiefly remembered at the present time as a biblical critic and a leader of the rational school. He first called the attention of German scholars to Astruc's discovery respecting the names for God in the Pentateuch, and adopted the theory that the synoptic Gospels derive their story from one common source (*Urevangelium*). His *Introductions to the Old and the New Testament* were the first purely literary historical treatment of the biblical writings. Other noteworthy works are: *Urgeschichte* (1790-93); *Einleitung in die apokryphischen Bücher des Alten Testaments* (1795); *Uebersicht der französischen Revolution* (1797); *Weltgeschichte* (1818-20). From 1812 he edited the Göttingen *Gelehrte Anzeigen.*

EICHHORN, Karl Friedrich (1781-1854). A German jurist and author, born at Jena, and educated at Göttingen. He successively occupied the chair of law at Frankfort-on-the-Oder (1805-11), Berlin (1811-17), Göttingen (1817-28), and Berlin (1832-34). He also filled several important positions in a judicial capacity under the Prussian Government. The principal works of Eichhorn, who may rightly be called the founder of the historical school of German jurisprudence, are the following: *Deutsche Staats- und Rechtsgeschichte* (5th ed., 4 vols., 1843-45), a summary of the historical legal jurisprudence of Germany; *Einleitung in das deutsche Privatrecht mit Einschluss des Lehnrechts* (5th ed. 1845); and *Grundsätze des Kirchenrechts* (1821-23; French translation by H. Jouffroy, 1843).

EICHHORST, IK′hōrst, Hermann Ludwig (1849—). A German physician, born and educated at Königsberg. In 1877 he was appointed director of the Medical Polyclinical Institute at Göttingen. In 1884 he became professor of pathology and therapy at the University of Zurich. He is the author of the following important works: *Lehrbuch der physikalischen Untersuchungsmethoden innerer Krankheiten* (3d ed. 1889); and *Handbuch der speziellen Pathologie und Therapie* (5th ed. 1895-96).

EICHLER, IK′lēr, August Wilhelm (1839-87). A German botanist. He was born at Neukirchen, and was educated at Marburg. In 1871 he became professor of botany and director of the Botanical Garden at Graz, whence he was called to the chair of botany at Kiel (1873) and Berlin (1878). Very valuable are his writings on the Coniferæ, Cycadaceæ, and other botanical species of Brazil. His principal work, *Blütendiagramme* (2 parts, 1875-78), advocates and describes the employment of comparative analysis. His other publications include: *Syllabus der Vorlesungen über spezielle und medizinisch-pharmazeutische Botanik* (5th ed. 1890); and *Beiträge zur Morphologie und Systematik der Marantaceen* (1884).

EICHRODT, IK′rōt, Ludwig (1827-92). A German humorous poet, born at Durlach. His cycle of songs, entitled *Wanderlust,* published by him in the *Fliegende Blätter* at the age of twenty-one, established his popularity as a humorist. In 1848 he founded, at Frankfort-on-the-Main, the humorous-satirical periodical, the *Satyr.* Eichrodt wrote a number of works chiefly distinguished for their parody, such as *Gedichte in allerlei Humoren* (published under the pseudonym of Rudolph Rodt; 3d ed. under the title *Lyrische Karikaturen,* 1869); *Rheinschwäbische Gedichte in mittelbadischer Sprachweise* (2d ed. 1873); *Lyrischer Kehraus* (2d ed. 1870). Eichrodt's collected poems, *Gesammelte Dichtungen* (Stuttgart, 1890), contain the well-known *Juvivallera,* a cycle of modern student songs.

EICHSTÄDT, IK′stĕt, Heinrich Karl Abraham (1772-1848). A German philologist, born at Oschatz. He was appointed professor of philosophy at Leipzig in 1795, and of eloquence and poetry at Jena in 1803. Through his occasional writings and addresses he became known as one of the first Latinists of his time. He was a friend of Goethe, in whose honor he wrote the *Oratio Goethii Memoriæ Dicata* (1832). He also published editions of the classics and a translation (1802-08) of Mitford's *History of Greece.* Consult *Goethes Briefe an Eichstädt,* edited by Biedermann (Berlin, 1872).

EICHSTÄTT, IK′stĕt. A town of Bavaria, situated on the left bank of the Altmühl, about 14 miles northwest of Ingolstadt (Map: Germany, D 4). Its cathedral, begun in the eleventh century, contains some fine stained glass, mural paintings, and the tomb of Saint Wilibald, besides a number of monuments in bronze and marble. The Church of Saint Walpurgis contains relics of the saint, and is visited by pilgrims. The town hall, dating from 1444, and the old summer palace of prince bishops, now used as barracks, are also noteworthy. There are a considerable number of educational institutions and a municipal theatre. Eichstätt produces beer, lithographic stones, matches, etc. Eichstätt is a place of considerable antiquity and is supposed to have had its origin in a Roman station. The place obtained municipal privileges in 908. It suffered greatly during the Thirty Years' War and was burned several times by the French during the eighteenth and nineteenth centuries. Population, in 1905, 7904. The bishopric of Eichstätt, founded in 745, was secularized in 1802 and annexed to Bavaria, but a new bishopric was organized in accordance with the agreement of 1817 between Bavaria and the Vatican.

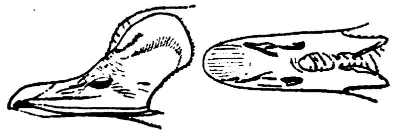
EICHTHAL, âsh'tâl', GUSTAVE D' (1804-86). A French publicist, born at Nancy. He was a pupil of Comte, a disciple of Saint-Simon, and a collaborator on the *Organisateur* and the *Globe*. To avoid the attacks upon Saint-Simonism he went to Greece, where he became interested in the rehabilitation of the country, which had been ruined by the War for Independence. His efforts were unappreciated by the Greeks and he returned to France and gave himself up to authorship. His works include: *Une histoire primitive des races océaniennes et américaines* (1845) and *Les origines bouddhiques de la civilisation américaine* (1864-65). Some of his essays on biblical criticism were collected and published by his son under the titles, *Mélange de critique biblique* (1886) and *La théologie et doctrine religieuse de Socrate* (1881).

EICHWALD, Ik'vält, EDUARD GEORG (1838-89). A Russian physician, son of Karl Eduard Eichwald, born at Vilna, and educated at the Medico-Surgical Academy at Saint Petersburg. He was physician-in-ordinary from 1865 to 1875 to the Grand Duchess Helena Pavlovna, who made him the legatee of a sum which enabled him to found the clinical institute subsequently named in honor of its patroness. In 1866 Eichwald was appointed professor of medical diagnosis and general therapy at the Medico-Surgical Academy, and in 1883 he became professor at Saint Petersburg. His works, published chiefly in German, include: *Die Kolloidentartung der Eierstöcke* (1864); *Beiträge zur Chemie der gewebbildenden Substanzen* (1873); and a treatise on general therapeutics in Russian, 5th ed. by G. Schapiro (1892).

EICHWALD, KARL EDUARD (1795-1876). A Russian naturalist and traveler, born in Mitau. He studied medicine and the natural sciences at Berlin, Vilna, and Dorpat, and became professor of zoölogy and obstetrics at Kazan in 1823, professor of zoölogy and comparative anatomy at Vilna in 1827, and professor of zoölogy and mineralogy at Saint Petersburg in 1838. He traveled extensively for scientific purposes in eastern and northern Russia, in the Caucasus, Persia, Algeria, and throughout Europe. Among his works are *Zoologia Specialis* (1829-31); *Fauna Caspio-Caucasia* (1841); *Die Urwelt Russlands* (1840-47); *Die Paläontologie von Russland* (1851).

EIDER, I'dẽr. A river of Schleswig-Holstein, Prussia, rising about 10 miles south of Kiel. It is the outlet of the small Lake Redden, and flows first northwest, then in a generally westward direction, entering the North Sea at Tönning, its total length being 115 miles (Map: Germany, C 1). In the lower part of its course it is from 600 feet to 1000 feet wide, with a depth of 15 to 18 feet; below Tönning the river expands into a bay. It is navigable from its mouth as far as Rendsburg, from which town navigation is carried on to Kiel by the Schleswig-Holstein Canal, which prior to the construction of the Kaiser Wilhelm Canal was the only artificial waterway connecting the North Sea with the Baltic.

EIDER (Icel. *æþr*, eider). An oceanic duck, having the hind toe furnished with a deep lobe, and the bill swollen and elevated at the base, and extending up the forehead, where it is divided down the middle by an elongated projection of feathers. The tertials are elongated, and fall down over the wing. The genus is further characterized by the very abundant development of a fine elastic gray down, particularly on the breast, the valuable eider-down of commerce.



BEAK OF KING EIDER.
Side and top views of the bill of *Somateria spectabilis.*

Several species are known, grouped into three genera. The best known and most important is the common eider of Europe (*Somateria mollissima*), which is intermediate in size between a common duck and a goose. The male is larger than the female, and in the breeding season has the under parts black, the upper parts creamy white. The female is pale-brown, tinged with red, and varied with transverse marks of dark brown. Young males at first resemble the females, and do not acquire the full adult plumage and begin to mate and breed until their third year. The eider is an inhabitant of the northern parts of the world, abounding on arctic and subarctic shores, and breeding in suitable localities from Spitzbergen to the Faroe Islands, off the northeast coast of England, where it is known as the Saint Cuthbert duck; it is also numerous in southern Greenland; and the shores of Alaska and Siberia are inhabited by a very similar species (*Somateria v-nigra*). All these descend to middle latitudes in winter. Two other distinctively American species of the genus exist. One is the American eider (*Somateria Dresseri*), which differs from the European bird (drake) mainly in having a black instead of an obscure green patch on the crown, and in the shape of the bill (see Plate of WILD DUCKS in article DUCK); the other is the king eider (*Somateria spectabilis*), which has a v-shaped black mark on the throat. Both breed on the coasts of Newfoundland and Labrador, and the latter goes also to the extreme north, where it is widespread. Both are favorites with sportsmen when they come south in winter along the coast as far as the Middle States and inland to the Great Lakes. Two other species are known, Steller's eider (*Eniconetta Stelleri*), which is abundant on the Arctic shores of Europe, Asia, and Northwestern America, and the spectacled eider (*Arctonetta Fischeri*), which seems to be confined to the northwest coast of America. The now extinct Labrador duck was nearly related to them.

EIDER-DOWN. The down from the breast of an eider, and taken from its nest, or from the body of a dead bird for commercial use. The eiders nestle upon coasts, seeking nooks and crannies in which to hide their treasures. As is the habit of many ducks, the mother begins, as soon as the eggs come, to pluck the easily removed down from her breast with which to cover them during her absences, thus both blanketing and concealing them. This down is mouse-gray and of the exquisitely soft texture which makes it so valuable. Formerly, as still in Greenland, which furnishes perhaps the largest part of the down sent to market, the down was taken from the wild nests found on coasts. Gradually a certain measure of protection was introduced in some European countries. The next movement was to dig a great number of convenient little hollows or chambers in the soil and among the rocks of sea-fronting hills—accommodations which the ducks were quick to take advantage of. Many such eider-folds exist in Norway and Iceland, and are regarded as property. The eggs and down are quietly taken from each nest at intervals of a few days by the owners of the 'eider-fold,' until the limit of the bird's endurance has been reached, when she is permitted to hatch a few eggs, in order to maintain the race.

About half a pound of eider-down is said to be obtained annually from each nest, but this is much reduced by cleaning. Down taken from birds which have been killed is inferior in quality to that obtained from the nests. The latter is known in commerce as 'live' down, the former as 'dead' down. The elasticity of the down is such that three-quarters of an ounce of it will fill a large hat, while two or three pounds of it may be pressed into a ball and held in the hand. Its use is most extensive in Germany for stuffing bed-coverings.

EIFEL, ī'*fel*, THE. A bleak and barren plateau situated in the Rhine Province, in Southwestern Prussia, between the Rhine on the east, the Roer on the west, and the Moselle on the south (Map: Prussia, B 3). It is in extent 40 miles by 20; the elevation averages from 1500 to 2000 feet, but an extreme altitude of nearly 2500 feet is reached. Its surface is diversified by depressions and ridges that show plainly its volcanic origin. The plateau belongs to the Devonian formation, and the volcanic eruptions have brought near the surface in some portions a limestone that is particularly rich in fossils. Above this, in some parts, is found another formation, containing considerable quantities of zinc and lead. In the south, colored sandstone adds variety to the scenery. In the lower valleys fruit and grain are cultivated, but above 1700 feet the climate is so raw that little grows besides heather. Grazing is extensively carried on in this region.

EIFFEL, ā'fĕl', ALEXANDRE GUSTAVE (1832 —). A French engineer. He was born at Dijon, December 15, 1832; studied at the Ecole Centrale; and in 1858 constructed the iron bridge over the Garonne at Bordeaux, and later the lofty and graceful bridge over the Douro at Oporto; also the remarkable viaducts of Garabit in Cantal, and of Montluçon; the designs for the locks of the Panama Canal; the frame on which Bartholdi's statue of 'Liberty Enlightening the World' was built; and the celebrated Eiffel Tower (q.v.), on the completion of which he was made an officer of the Legion of Honor. In 1893 he was sentenced to fine and imprisonment for complicity in the Panama Canal frauds, but the sentence was annulled by the Court of Cassation.

EIFFEL TOWER. A colossal structure erected in the Champs de Mars, at Paris, by the famous engineer Gustave Eiffel (q.v.). It was completed March 31, 1889, in time to serve as one of the notable features of the exposition of that year. The lower section of the tower consists of four built-up iron columns, each of which consists of four smaller columns, resting on masonry piers, and giving a supporting base 330 feet square. Around each of the four piers is a masonry wall 85 feet square and about 30 feet high, out of which the piers seem to spring. The four main columns curve toward each other until they unite in a single column, 620 feet above the ground. The piers are connected by arches some distance above the ground. There are platforms at the 189 feet, the 380 feet, and the 906 feet levels, which are reached by elevators as well as by stairs. Beyond the third platform a spiral staircase, which is not open to the public, ascends to the top of the tower, which is 984 feet (300 meters) above the ground. In each of the four piers there are elevators; but two of these run to the first platform only, and the other two stop at the second platform. A third set of elevators runs between the second and third platforms, or 526 feet, one elevator making half the distance and the other the remainder. Each of these elevators may carry sixty-three persons. Otis elevators, American make, run from the ground to the second platform. On the first platform, which has a floor space of 38,000 square feet, or nearly an acre, there were four restaurants at the time of the exposition. Search-lights are mounted near the top of the tower, and here is a meteorological observatory, with physical and biological laboratories. The view from the Eiffel Tower extends to a distance of about 85 miles. In the construction of the tower some 7000 tons of iron were used; and the cost was estimated at considerably over $1,000,000, of which about $292,000 was voted by the Government, while the remainder was supplied by M. Eiffel, who trusted for his reimbursement to the receipts from admission fees during the twenty years for which he is entitled to the profits of the tower. The profits for the year 1889 alone nearly paid for the cost of the tower.

EIGENMANN, ī'*gen*-män, CARL H. (1863—). An American zoölogist, born at Flehingen, Germany. He graduated in 1886 at Indiana University (Bloomington), studied at Harvard, and was connected with the biological laboratory at San Diego, Cal., and the marine biological laboratory at Wood's Holl, Mass. In 1890, 1891, and 1892 he made scientific explorations in Dakota, Montana, Idaho, Oregon, California, and the western part of Canada for the British Museum. He was appointed professor of zoölogy at Indiana University in 1891, and founded there in 1895 a biological station of which he became director.

EIGHTH NERVE. See AUDITORY NERVE.

EIGHT-HOUR DAY. The eight-hour day as the ideal working day was proposed in England as early as 1833. A trade-union congress at Birmingham demanded in 1869 that the eight-hour day should be adopted throughout the United Kingdom. With the growth of the Social Democratic Federation in the early eighties, the eight-hour agitation became general. The socialists sought to secure the desired results through legislation, the trade unions through combined action against individual employers. The trade unions, however, have gradually come to look with more favor upon legislation looking toward the general establishment of an eight-hour day. The eight-hour day has been adopted by some British municipalities, and also for certain classes of work in the government naval shops. In 1866 the National Labor Union of the United States demanded it. Eight-hour leagues were formed during the strikes of 1872-73. The first law affecting National Government employees was passed in 1869 and put into effect in the navy yards. The eight-hour day is now in force for all Government work. The following States have laws affecting either public works; State, county, or municipal employees; California, Colorado, Idaho, Kansas, Massachusetts, New York, Utah, Washington, and West Virginia. A few trades have gained an eight-hour day, for several it is required by law, but for the great mass of laborers of the United States and England it is still an unsatisfied demand.

On the Continent of Europe a widespread agitation in favor of an eight-hour day developed in the last quarter of the nineteenth century. Since 1880 the demand for an eight-hour day has formed a part of the programme of the powerful labor parties of France and of the Social Democratic Party in Germany. Throughout the Continent, labor organizations and socialist parties favor the enactment of laws reducing the working day to eight hours. Through the support of the present German Emperor, the movement has attained some positive results in Germany. The eight-hour day has been established in some of the industrial enterprises of the Government, and in a few trades.

In Australia the movement has made greater headway than in any other country. Public sentiment is strongly in favor of a legal eight-hour day. As early as 1856 the stronger trades in Melbourne were able to enforce an eight-hour day; and the movement rapidly spread to the smaller cities of Victoria and to the other colonies. In the colony of Victoria the hours of women working in factories were in 1874 limited to eight; in 1885 the same restriction was extended to all employments of women and boys. The eight-hour day was in 1877 prescribed by law for all men working underground; and it has been extended to men employed on many public and quasi-public works. See LABOR, AMERICAN FEDERATION OF; LABOR PROBLEMS; TRADE UNIONS. Consult: Rae, *Eight Hours for Work* (New York, 1894); Webb and Cox, *The Eight Hours Day*.

EIKON BASILIKE, ī'kŏn bȧ-sĭl'ĭ-kė (Gk. εἰκὼν βασιλική, kingly likeness). The name of a book, the full title of which is ΕΙΚΩΝ ΒΑΣΙΛΙΚΗ, *The Pourtraicture of His Sacred Majestie in His Solitudes and Sufferings* (1648). It was published probably at The Hague, and, appearing immediately after the execution of Charles I., professed to be from his Majesty's pen. Milton, in the *Iconoclastes* (1649), assailed it, suggesting doubts also as to its genuineness. The Royalists, on the other hand, warmly defended the theory of royal authorship; but after the Restoration John Gauden, Bishop of Exeter, asked for promotion to the bishopric of Worcester on the ground that he had himself written the book. It is an important fact that the Royalist Clarendon, author of the *History of the Rebellion*, at once accepted this unpalatable statement of the matter. As others, however, refused to credit Gauden, the controversy has raged to the present day. If Gauden was the author, as most authorities now believe, he must have entered thoroughly into the spirit of Charles, though he necessarily idealized the King's character. Consult especially: Wordsworth, *Who Wrote* Εἰκὼν Βασιλική? (Cambridge, 1824); Todd, *Bishop Gauden the Author of Icôn Basilike, Further Shown in Answer to the Recent Remarks of Rev. Dr. Wordsworth* (London, 1825); Toland, *Amyntor* (London, 1699); Tuckerman, *On the Author of* Εἰκὼν Βασιλική, (Berlin, 1874); Godwin, *History of the Commonwealth*, ii., pp. 684ff. (London, 1826); Hallam, *Constitutional History of England*, ii., pp. 313f., 636-42 (London, 1828); Almack, *Bibliography of the King's Book, or Eikon Basilike* (London, 1896), very valuable. See GAUDEN, JOHN.

EILDON (ēl'don) **HILLS.** Three peaks in Roxburghshire, Scotland, near Melrose, of traditional interest, and celebrated for the extensive view from their summits (Map: Scotland, F 4). The highest is 1385 feet.

EI'LEITHY'IA (Lat., from Gk. Εἰλείθυια), or **EILEI'THYAS'POLIS.** The Greek name of the ancient Egyptian city of **Nekheb** (the modern El-Kab), situated on the right bank of the Nile, a little below Edfu. From very ancient times it was one of the most important cities of Egypt, and was strongly fortified. Its ancient walls still exist in an excellent state of preservation. In Ptolemaic times the city was the capital of the Third Nome of Upper Egypt. The princes of **Nekheb** played a very important part politically, and many of them were governors of Nubia. The local deity, **Nekhbet,** was the tutelary goddess of Upper Egypt and the special patroness of the King. She was supposed to preside over birth, and was therefore identified by the Greeks with Eileithyia (whence the Greek name of the city) and by the Romans with Lucina. Nekhbet is represented as a vulture with outspread wings, as a woman wearing the crown of Upper Egypt, or as a winged uræus serpent. Near the remains of the ancient city are the ruins of a temple built under Rameses II. by Setaw, Governor of Nubia; of another built by Amenophis III. and dedicated to the local goddess; and of a third temple built in late Ptolemaic times and likewise dedicated to **Nekhbet.** All three temples are richly decorated, and contain numerous inscriptions. The most important remains at El-Kab are, however, the rock-hewn tombs. Among them are the tomb of the admiral Aahmes who took part in the expulsion of the Hyksos (q.v.) from Egypt; that of his namesake and younger contemporary, the general Aahmes

(Pen-necheb); and that of the nomarch Paheri, tutor to Prince Nazmes, son of King Amenophis I. The two former tombs especially contain inscriptions of the highest historical value. Consult: Wilkinson, *Modern Egypt*, ii. (London, 1843); Champollion, *Notices descriptives* (Paris, 1844); Brugsch, *Reiseberichte aus Aegypten* (Leipzig, 1855); Tylor and Griffith, "The Tomb of Paheri at El-Kab," *Egyptian Exploration Fund Memoirs*, vol. xi. (London, 1894).

EILENBURG, ĭl'len-bōōrk (anciently called *Ilburg*). A town of the Prussian Province of Saxony, situated mainly on an island in the river Mulde, about 15 miles northeast of Leipzig (Map: Germany, E 3). It is a busy industrial town, and has manufactures of calico, woolen yarn, tobacco, chemicals, celluloid, beer, and agricultural implements. Franz Abt, the song-writer, was born here. Population, in 1890, 12,447; in 1900, 15,147; in 1905, 15,721.

EIMBECK, ĭm'bĕk, WILLIAM (1841—). An American geodesist, born in Brunswick, Germany. He became assistant civil engineer in the public offices of Saint Louis, Mo., a professor for two years in Washington University, Saint Louis, and a member of the United States solar eclipse expeditions of 1869 (to Illinois) and 1870 (to Italy). His most important work has been in connection with the thirty-ninth parallel triangulation (Western division), and with the invention of the invariable reversible pendulum and the duplex base apparatus employed in the Geodetic Survey.

EIMEO, ī'mė-ō, or **MORE'A**. One of the Society Islands (q.v.), situated 25 miles west-northwest of Tahiti, in latitude 17° 30′ S. and longitude 149° 50′ W. It covers an area of about 50 square miles, and has several good harbors. Its surface is diversified, being partly forest. Its highest elevation reaches nearly 4000 feet. It contains a missionary station, and most of the inhabitants are Protestants. Population, in 1897, 1600.

EIMER, ī'mĕr, THEODOR (1843-98). A Swiss-German zoölogist, born in Stäfa. He studied medicine and the natural sciences in Heidelberg, Würzburg, Freiburg, and Berlin. In 1870 he became privat-docent in Würzburg, and in 1875 professor of zoölogy in Tübingen. In 1878-79 he made a scientific journey to Egypt. He wrote: *Zoologische Studien auf Capri. Beroë Ovatus und Lacerta Muralis Cœrulea* (1874); *Die Medusen* (1879); *Untersuchungen über das Variieren der Mauereidechse* (1881); *Die Entstehung der Arten auf Grund der Vererbung erworbener Eigenschaften* (1888; 2d ed. 1897); *Artbildung und Verwandtschaft bei den Schmetterlingen* (1889; 2d ed. 1895).

EINBECK, ĭn'bĕk, or **EIMBECK**. An old town in the Prussian Province of Hanover, on the Ilme, about 40 miles south-southeast of Hanover (Map: Germany, C 2). Traces of its great antiquity and former importance are still noticeable in the remains of its walls and some of its ancient buildings. The cathedral, a handsome edifice, dates from the fourteenth century. The town owns its water-supply and gas-works. Its manufactures include belts, linen, carpets, sugar, tobacco, and roofing-felt. The famous Eimbecker beer, which has given its name to the well-known term "bock," is still brewed to a considerable extent. Population, in 1890, 7676; in 1900, 7914; in 1905, 8709. Einbeck grew up around a cathedral chapel reputed to contain the blood of the Saviour and visited by throngs of pilgrims. It was a member of the Hanseatic League. In 1626 it was captured by Pappenheim, in 1641 by Piccolomini, and in 1761 by the French, who dismantled its fortifications.

EINHARD, ĭn'härt, frequently but erroneously called **EGINHARD**, ā'gĭn-härt (c.770-840). The biographer of Charles the Great. He received his early education in the Monastery of Fulda, where he did so well that he was sent to finish his education at the school in the palace of Charles the Great. His talents and acquirements gained him the favor of the Emperor, who appointed him his private secretary and superintendent of public buildings. In 806 he was dispatched by Charles on a mission to Pope Leo III. On the death of the Emperor he was appointed by Louis the Pious abbot of various monasteries, but ultimately he retired to the town of Mühlheim. Here he erected a monastery, which caused the name to be changed from Mühlheim to Seligenstadt (City of the Blessed). Einhard died on March 14, 840, and was buried beside his wife, who died in 836. The two coffins are now shown in the chapel of the castle at Erbach. The counts of Erbach trace their descent from Einhard. His *Vita Caroli Magni*, completed about the year 820, in respect to plan, execution, language, and style, is incontestably the most important historical work of a biographical character that has come down to us from the Middle Ages. It was frequently used as a school book, and was therefore copied *ad infinitum*. His *Epistolæ* are also of great value for the history of the later years of Louis the Pious. Einhard also wrote an account of the translation of the relics of Saints Marcellinus and Peter from Rome to Seligenstadt. To Einhard also are ascribed the so-called *Annals of Einhard* and a rhythmical *Passion of the Martyrs Marcellinus and Peter.* According to a legend of the later Middle Ages, Einhard's wife, Emma, was a daughter of Charlemagne. Love had arisen between them, and on one occasion, when the two had clandestinely met at night in Emma's chamber, a sudden fall of snow covered the spacious court, thus rendering retreat impossible without leading to discovery. As the traces of feminine footsteps could not excite suspicion, Emma carried her lover across the court on her shoulders. This scene, it is said, was observed from a window by Charlemagne, who united the pair in marriage. On this legend Fouqué founded his romance of *Eginhard und Emma*, and Longfellow has made it the subject of a short poem. For the editions of Einhard's works, and for special studies, consult Wattenbach, *Deutschlands Geschichtsquellen*, vol. i. (Berlin, 1893-94).

EINSIEDELN, ĭn'zė-dĕln. A town in the Canton of Schwyz, Switzerland, 26 miles southeast of Zurich. It is visited yearly by 150,000 pilgrims, most of whom come from Switzerland and southern Germany (Map: Switzerland, C 1). There are numerous hotels and inns for the devout worshipers. The principal industry is the manufacture of images of saints, crucifixes, and other devotional objects that are exported to all parts of the Roman Catholic world. The road up to the celebrated Benedictine Monastery of Einsiedeln, which is 2900 feet above the village, passes the house where Paracelsus (q.v.) is said to have been born. The monastery buildings, in the midst of a gloomy forest that was once extensive, and surrounded by a quadrangle of walls, were six times partially or entirely destroyed by fire before the seventeenth century, and in 1704-19 were rebuilt in the Italian style. At the entrance of the church are statues of the emperors Otho I. and Henry II. In the nave is the black marble chapel, through the grating of which is visible the renowned miracle-working image of the Virgin, small but richly bedecked and bejeweled. The gorgeous chandelier was given by Napoleon III. in memory of his mother. The monastery has a library of 40,000 volumes and 1200 manuscripts, a seminary, a gymnasium, and a lyceum. It owes its origin to the hermit Meinrad, who erected a chapel for the image of the Virgin which had been given him by the Abbess Hildegard, and which has made Einsiedeln one of the most famous of Catholic pilgrimages. The founder of the monastery was Eberhard, provost of Strassburg, who began the building in 934. The town and district of Einsiedeln had a population of 8551 in 1900. The Protestants number only 83. The picturesque vicinity affords fine views of the Alps and the Lake of Lucerne. Consult Brandes, *Die Feier des tausendjährigen Bestehens von Maria Einsiedeln* (Einsiedeln, 1862).

EISELEN, Ī'ze-len, Ernst Wilhelm Bernhard (1793-1846). A German promoter of athletic exercise, born in Berlin. He established the terms still used in German fencing. In 1818 he opened a public gymnasium in Berlin, which was followed in 1832 by one especially designed for the gymnastic training of girls. He was one of the foremost promoters of those athletic exercises which have directly and indirectly contributed to the physical improvement of the Germans, becoming bases of military training, and conducing to the splendid successes achieved by the German arms during the nineteenth century. It is interesting to note that it was largely from these transplanted gymnasia, or *Turnvereine*, that some of the best German volunteers of the Civil War in the United States were recruited. The literary productions of Eiselen include: *Deutsche Turnkunst*, in association with Jahn (1816); *Hantelübungen*, 3d ed. 1883); *Abbildungen von Turnübungen* (5th ed. 1889); *Das deutsche Hiebfechten* (new ed. 1882); *Abriss des deutschen Stossfechtens* (new ed. 1889).

EISENACH, Ī'ze-näG. A town of the Grand Duchy of Saxe-Weimar, and former residence of the Principality of Eisenach, situated at the northwestern end of the Thuringian Forest and at the confluence of the Nesse with the Hörsel, 45 miles west of Weimar (Map: Germany, D 3). The town is well laid out, and has a number of squares, one of which, the Lutherplatz, contains the house where Luther lived while studying at Eisenach, and another, Karlsplatz, is adorned with a bronze statue of Luther. The most noteworthy ecclesiastical edifices are the Church of Saint Nicholas, dating from the twelfth century, with an octagonal tower; the Church of Saint George, a large Gothic edifice with a bronze statue of Sebastian Bach, a native of Eisenach. Other interesting buildings are the palace, erected in 1742; the town hall; the Klemda, an old castellated building dating from the thirteenth century, and now occupied by a club; the theatre; and the house where Sebastian Bach was born. Not far from the town, on a lofty eminence, is situated the Castle of Wartburg, the residence of the mediæval landgraves of Thuringia, dating probably from the eleventh century, but mainly built in the succeeding centuries, and recently restored. It consists of two main parts, the Vorburg and the Hofburg, the former containing the Ritterhaus and stables, and the latter the apartments of the landgraves. Among the rooms in the Vorburg, the most interesting is that occupied by Luther while he worked on his famous translation of the Bible. The Hofburg contains many halls of great splendor, including the Sängersaal, where, according to local tradition, the contests of the Minnesingers were held under the patronage of the Landgrave Hermann I. (1190-1217), as described in the old poem, *Kriec von Wartburg*. The castle is now occasionally occupied by the Grand Duke of Weimar.

Among the educational institutions of Eisenach, the most prominent is the gymnasium, formerly a Latin school, which counted among its pupils Luther and Sebastian Bach. Eisenach has some well-developed manufacturing industries, and produces paint, chemicals, woolen goods, leather, pottery, shoes, tobacco, and cigars. It owns its water-supply, has an electric street railway, and is lighted by gas and electricity. The neighborhood of Eisenach is of remarkable picturesqueness, ornamented with splendid gardens and magnificent residences. The town was founded in 1070, near the older town of Isenach, or Isenacum. It prospered under the protection of the landgraves of Thuringia, the owners of the Wartburg, and was, from 1596 to 1741, the residence of the princes of Eisenach. Population, in 1890, 21,399; in 1900, 31,442; in 1905, 35,123. Consult: Storch, *Beschreibung der Stadt Eisenach* (Eisenach, 1831); Schwerdt and Jäger, *Eisenach und die Wartburg* (ib., 1871); Warnatz, *Die Wartburg und Eisenach in Sage und Geschichte* (Vienna, 1881); Scheller, *Eisenach und Umgebung*, edited by Kühner (Eisenach, 1898).

EISENACH CHURCH CONFERENCE, or Evangelical Church Conference. The name given to periodical meetings of representatives of the Protestant churches of the German States and Austria. The first was held at Berlin in 1846, and included representatives from nearly all the German States; the second at Eisenach, in 1852; and since 1854 they have been held every two years at the latter place. The aim is the discussion of questions of general interest and the promotion of unity among the individual churches. The conference opened in 1903 at Jerusalem for the study of archæological investigations in Palestine. Since 1852 the conference has published at Stuttgart a central organ, the *Allgemeine Kirchenblatt für das evangelische Deutschland*.

EISENBERG, Ī'zen-bĕrk. An old town in the Duchy of Saxe-Altenburg, Germany, situated near the Saale, 24 miles west-southwest of Altenburg, and 36 miles southwest of Leipzig. It contains a ducal palace, with a fine church and gardens, and manufactures woolens, velvet, pottery, and agricultural machines. Population, in 1900, 8764; in 1905, 9956.

EISENERZ, ī'zen-ĕrts. A market-town of Styria, Austria, about 2350 feet above sea-level, on the Erzbach, 24 miles northwest of Leoben (Map: Austria, D 3). The Gothic Church of Saint Oswald, founded in 1279, is an excellent example of the fortified type of ecclesiastical architecture. The town derives its importance from its proximity to the Erzberg, a mountain about 5000 feet high, containing valuable deposits of iron ore. About 2000 miners are employed in the quarries on the mountain, the annual output being about 150,000 tons, of which about 40 per cent. is metal. Aragonite (*Eisenblüte*, or *flos ferri*), resembling branching coral in form, and of the most beautiful and purest white, is found in grottoes in the interior of the mountain. Population, in 1890, 5700; in 1900, 6494.

EISENLOHR, ī'zen-lōr, AUGUST (1832-1902). A German Egyptologist, born in Mannheim. He studied theology at Heidelberg and Göttingen, and later became interested in the natural sciences and the manufacture of chemical products, abandoning both, however, for the study of Egyptology. In 1872 he was made an extraordinary, and in 1885 full, professor at Heidelberg University. His chief works are: *Der grosse Papyrus Harris* (Leipzig, 1872); "The Political Condition of Egypt Before the Reign of Rameses III.," in the *Transactions of the Society of Biblical Archæology* (London, 1872); *Ein mathematisches Handbuch der alten Aegypter* (Rhind papyrus of the British Museum, trans. with explanatory notes, Leipzig, 1877).

EISENLOHR, THEODOR (1805-69). A German divine and educator. He was born at Herrenberg, and studied theology at Tübingen. After holding several pastorates and conducting the seminary at Nürtingen, Württemberg, he became a member of the consistory and a counselor of the Board of Public Instruction in that city. He was editor of the departments of ecclesiastical and educational law in Reyscher's *Sammlung der württembergischen Gesetze*, vols. viii., ix., and xi. (Tübingen, 1834-39), and published the work entitled *Das Volk Israel unter der Herrschaft der Könige* (1855-56), in which he endeavors to show the great importance of biblical history as an educational factor.

EISENLOHR, WILHELM (1799-1872). A German physicist, born at Pforzheim. He studied mathematics and physics at Heidelberg, and became professor of physics at the Polytechnical Institute at Karlsruhe in 1840. He established the first industrial school of Baden, at Mannheim, and assisted in the organization of all similar institutions afterwards erected in that grand duchy. His principal publication is the popular text-book entitled *Lehrbuch der Physik* (11th ed., 1876).

EISENMENGER, ī'zen-mĕng'ẽr, AUGUST (1830—). An Austrian painter, born in Vienna. He was a pupil of the Vienna Academy (1845-48) and of Rahl, and from 1872 to 1901 was a professor in the Academy. His more important works include various frescoes in the Austrian Museum at Vienna; a series of historical pictures illustrative of the reign of Emperor Maximilian I., in Castle Hörnstein, near Vienna (1872-79); and the decorative painting in the session-room of the Chamber of Deputies in the Reichsrat building at Vienna (1885).

EISENMENGER, JOHANN ANDREAS (1654-1704). An anti-Semitic writer. He was born at Mannheim, studied Oriental languages at the Collegium Sapiential, in Amsterdam, and became professor at Heidelberg in 1700. His principal work was entitled *Entdecktes Judentum*, and was published at Königsberg, Prussia, at the personal expense of the King of Prussia, in 1711. It was compiled from nearly two hundred Hebrew and about twelve Judeo-German sources, including material drawn from books written by converted Jews. The work has been characterized as a collection of scandals, in which the facts have been so treated as to serve the purpose of the author. An abridged edition was published by F. X. Schieferl at Dresden in 1893.

EISENSTADT, ī'zen-stät, or **KISMARTON**. A town of Hungary, county of Ödenburg, in the centre of rich vineyards, at the foot of the Leitha Mountains, about 25 miles southeast of Vienna. Its chief architectural feature is the magnificent palace of Prince Esterházy, erected in 1863 and greatly enlarged in 1805. The palace is situated amid fine grounds, containing an orangery and fine greenhouses. Its library is particularly rich in musical manuscripts. In the church of the Franciscan monastery is the burial vault of the Esterhazy family. Near the town is the Church of Maris-Einsiedel, a favorite resort of pilgrims, and the burial-place of the composer Joseph Haydn, who was the conductor of Prince Esterhazy's orchestra from 1760 to 1790. Population, in 1890, 2972; in 1900, 2951.

EISENSTEIN, ī'zen-stīn, FERDINAND GOTTHOLD MAX. (1823-52). A German mathematician, born in Berlin. He wrote for Crelle's *Journal* at the age of fifteen, secured his doctor's degree after only three semesters at Breslau, was adjunct professor at that university at twenty-four, and was a member of the Berlin Academy at twenty-nine. Although he died before he was thirty, his literary work was extensive. He wrote on the theory of numbers, theory of functions, and other branches of higher mathematics, thirty-seven of his memoirs being found in the first fifty volumes of Crelle. Gauss ranked him with Archimedes and Newton.

EISFELD, īs'fĕlt, THEODOR (1816-82). A German-American musician and conductor. He was born at Wolfenbüttel, Germany, and when but twenty-three years of age was appointed kapellmeister of the Court Theatre of Wiesbaden, which position he held for four years (1839-43), going afterwards to Paris, where he had the direction of the *Concerts Viviennes*. In 1848 he moved to New York, and became one of the leading factors of musical America, taking an especially active part in the musical life of New York. He was the conductor of the Philharmonic and of the Harmonic societies, and, in connection with Noll, Reyer, and Eichhorn, established the celebrated quartet *soirées* of 1851. A nervous affection caused by shock arising from the burning of the ocean steamer *Austria*, of which he was one of the few survivors, cut him off from all further musical activity. He died at Wiesbaden.

EISK. See YEISK.

EISLEBEN, īs'lā'ben. A town of the Prussian Province of Saxony, situated about 18 miles west-northwest of Halle (Map: Prussia, D 3). It is the centre of a rich mining district, and consists of the old town, new town, and three suburbs. The town possesses great historic interest as the place where Martin Luther was born and died. The house in which he was born, partially destroyed by fire in 1689, was rebuilt through voluntary contributions, and has been converted into a free school. The house in which he died has also been restored, and contains numerous relics. The Church of Saint Andrew contains Luther's pulpit, busts of Luther and Melanchthon, and monuments of the counts of Mansfeld. In the Church of Saint Peter and Saint Paul are preserved the font in which Luther was baptized, his leather cap, and a fragment of his cloak. The town has a gymnasium, founded by Luther shortly before his death. The chief industry of Eisleben is the smelting of copper and silver, obtained from the mines in the vicinity. Population, in 1900, 23,900; in 1905, 25,120. Eisleben, known in the tenth century as Islebin, came into the possession of the counts of Mansfeld in the Twelfth Century, to whom it belonged until the extinction of that line in 1780, when it passed to Saxony, and later, in 1815, to Prussia.

EISTEDDFOD, âs-tĕᴅ′vŏd (Welsh, from *eistedd*, to sit + *mod*, circle). A Welsh word, meaning literally 'sitting,' or 'session.' It is applied to the assemblies of bards and people, of which there are two sorts—the national or general body, and the provincial gatherings which take place in many parts of Wales, and even among the Welsh in the United States. The institution is supposed to be of very ancient origin; but the eisteddfods traditionally ascribed to the fifth, sixth, and seventh centuries can hardly be deemed historic. In 1100 Gruffydd ap Cynan is supposed to have held a great national eisteddfod at Caerwys, and in 1176 Lord Rhys is known to have held at his castle of Aberteifi a grand festival with musical competitions—the earliest eisteddfod of which we have any actual account. In the twelfth century, as Professor Rhys observes, the eisteddfod appears to have been "a regularly constituted court, bearing all the marks of antiquity." Its function was to license bards and regulate their privileges. Again in the time of the Tudors we find the eisteddfod recognized as a tribunal of authority, and Queen Elizabeth in 1568 issued a commission for holding one. In the seventeenth century the eisteddfod seems to have fallen into abeyance, and it was not revived until the nineteenth. It has now become an institution of prime importance for the intellectual life of the Welsh people. The national gathering is held every year in North and South Wales alternately, and is attended by many thousands of people.

Consult Rhys and Brynmor-Jones, *The Welsh People* (London, 1900). The programmes of some recent eisteddfods have been published in *Y Cymmrodor*. See Bards.

EITELBERGER VON EDELBERG, ī′tel-bĕrᴋ′ĕr fôn ā′del-bĕrᴋ, Rudolf (1817-85). An Austrian art historian, born at Olmütz. He was made professor of the history of art at the University of Vienna in 1852, and took an active part in the founding of a School of Decorative Arts and of the Museum of Arts and Industries at Vienna. His works, critical and historical, have done much to stimulate the study of art and to promote the industrial arts in Austria. Among them are: *Die Reform des Kunstunterrichts* (1848); *Mittelalterliche Kunstdenkmale des österreichischen Kaiserstaats* (1858-60); and, in collaboration, *Quellenschriften für Kunstgeschichte und Kunsttechnik des Mittelalters und der Renaissance* (1871-82).

E′JA (Egypt.). The desert saw-viper. See Saw-Viper.

EJECTMENT (from *eject*, from Lat. *ejicere*, to throw out, from *e*, out + *jacere*, to throw), Action of. An action brought to recover possession of land, and also to obtain damages for its being wrongfully withheld from the person who brings the suit. This, in the common-law practice, is the only surviving instance of a mixed action; that is, one partaking in part of the nature of a real action for the recovery of the land, in part that of a personal action for damages. The origin of the action is to be found in the old writ of *ejectio firmæ*, or *termæ* (ejectment from a term of years), which (originally only an action in trespass, whereby a tenant for years could recover damages for an eviction or ouster) was so shaped as to entitle him to recover the possession of his lands. Being a simpler and more expeditious remedy than the various possessory actions provided by the common law, such as the *writ of novel disseisin*, and the like, for recovering the possession of freehold lands, it came in process of time to be employed for this purpose in all cases of wrongful dispossession until it had completely superseded the more cumbersome remedies afforded by the common-law writs.

The process of establishing title to real estate by this action was formerly—and still is, in some jurisdictions—a most intricate and serious one. As has been said above, the original action of ejectment was brought, not to recover the land itself, but to recover damages for the injury sustained on account of being deprived of the use of the land for a certain term. To maintain such an action the plaintiff was obliged to show: (1) Good title in the owner alleged; (2) a lease by him; (3) entry on the land by his lessee; (4) ouster from the land. But as, when it was desired to test the question of title, this state of facts very likely might not exist, and as common-law procedure had provided no other way of testing the title, a series of fictions was introduced into the case.

In England this form of action of ejectment was abolished in 1852, though the name was still retained. By the judicature acts of 1875 actions for the recovery of land were placed on the same footing as other actions, and what had been retained of the old common-law action was superseded by a simple and uniform method. Legislation to a similar effect has been adopted in several of the United States; in others the action of ejectment is maintained in much the same condition in which it was left after the English act of 1852; in a very few others the ancient form is still in use. The remedy given by an action of ejectment is one that may ordinarily be used for the recovery only of corporeal property, not of incorporeal hereditaments, such as an easement or a profit *à prendre*, though there are a few instances of its use for the latter purpose also; nor will such an action lie to recover personal property. An action of ejectment may be brought by any one who has the legal right to enter and possess the land, without regard to the exact character of his estate therein; and any person may be made defendant who has wrongfully seized or held the property under a claim of right against one holding a lawful estate therein. The burden of proof of title lies with the plaintiff, the presumption of law being in favor of the actual possessor, who need not, therefore, prove his own title otherwise than against the plaintiff. The verdict in an ejectment suit is for the plaintiff to recover peaceable possession of the land, or for the defendant to retain his possession. Under the old practice the damages which might be given to the plaintiff, together with possession, were purely nominal; a supplementary suit might be brought if substantial damages were really demanded. But under the later English practice, and certainly in several of our States, substantial damages may be granted in the original action. Such damages may also be in the nature of an accounting for *mesne*, or intermediate, profits. (See ACTION; POSSESSION, LAW OF; TITLE; LEASEHOLD; ESTATE. Consult: Blackstone's *Commentaries on the Laws of England;* Stephen, *New Commentaries on the Laws of England* (14th ed. London, 1903); Digby, *Introduction to the History of the Law of Real Property* (5th ed. Oxford, 1899); Pollock and Maitland, *History of English Law* (2d ed. Boston, 1899).

E'JOO PALM. See GOMUTI.

EKATERINBURG, yȧ-kä'tȧ-rĕn-bōōrg'. A fortified town in the Province of Perm, Russia, situated on the eastern slope of the Ural Mountains, on both banks of the Isset, 180 miles southeast of Perm and 1200 miles east-northeast of Moscow (Map: Russia, K 3). Ekaterinburg is the seat of an archbishopric and of the administration for the Ural mines, and is in the centre of the mining districts of these mountains. Among its institutions are a museum of mineralogy, an excellent chemical laboratory, a meteorological school for miners, an imperial mint, numerous works for cleansing and amalgamating metals, and for cutting and polishing precious stones. A considerable trade, principally in cattle, tallow, and iron, is carried on. Ekaterinburg is connected by rail with Cheliabinsk, on the Trans-Siberian line. In the vicinity are the gold-mines of Niviansk and Beresov. Ekaterinburg was founded by Peter the Great in 1722, and was named after Empress Catharine I. Population, in 1897, 55,500.

EKATERINODAR, yȧ-kä'tȧ-rē-nō-där'. The capital of the Kuban Territory, Northern Caucasia, situated on the right bank of the Kuban, over 150 miles south-southwest of Rostov and 960 miles south of Moscow. It is a fortified town, and is surrounded on all sides by swamp and morass. The streets are broad and straight, but unclean (Map: Russia, E 6). The territorial Museum of Natural History is in Ekaterinodar. Farming, gardening, cattle-raising, and fishing are the principal industries of the town. It holds three active fairs annually, and is the seat of a considerable trade in cattle. Ekaterinodar was founded in 1794 by Dnieper Cossacks and named after the Empress Catharine II. Population, in 1897, 65,700.

EKATERINOSLAV, yȧ-kä'tȧ-rē-nō-släf'. A fortified town of South Russia, capital of the Government of Ekaterinoslav, situated on the right bank of the Dnieper, above its rapids, 250 miles northeast of Odessa and 630 miles south-southwest of Moscow (Map: Russia, D 5). A monument of the Empress Catharine II., the old palace, once the residence of Prince Potemkin, and, above all, the remarkable bridge across the Dnieper, are among its most noteworthy structures. There are numerous churches, including one of Protestant denomination, and the educational institutions include a technical trade school, with free lectures. Ekaterinoslav has two fine parks, the one on the banks of the river being especially attractive. There are a number of steam flour-mills, foundries, tanneries, etc. The position of the city on the Dnieper is very favorable to its commercial and industrial development; but its direct communication with the Black Sea is greatly impaired by rapids. A large trade is carried on, chiefly in grain, cattle, timber, and wool. There are held three fairs during the year. Population, in 1900, 135,552. The Polish fortress Kaidaki, built in 1635, occupied the present site of Ekaterinoslav. In 1778 a district town by the name of Ekaterinoslav was founded by Prince Potemkin on the Samara River, but, owing to the insalubrity of the site, the town was removed to the present site of Ekaterinoslav in 1783.

EKATERINOSLAV. A government in South Russia, bounded by the governments of Poltava and Kharkov on the north, the province of the Don Cossacks on the east, the Sea of Azov and the Government of Taurida on the south, and Kherson on the west (Map: Russia, F 5). Its area is about 24,478 square miles. It forms an extensive steppe with some elevations along the rivers and almost without forests. It is watered chiefly by the Dnieper and the Donetz. The climate is moderate and the winters short. The average temperature varies from about 20° for the winter to nearly 72° for the summer. The soil is very rich in minerals, and the Government of Ekaterinoslav forms one of the chief mining centres of European Russia. There are vast deposits of coal, iron, zinc, and salt. Agriculture and stock-raising engage most of the inhabitants. There are raised large quantities of wheat, and also some southern fruits. The annual output of coal exceeds 2,000,000 tons, of which a considerable part is mined by peasant associations. The chief manufacturing establishments are machine-works, flour-mills, foundries, tobacco-factories, etc., and the total number of people employed exceeds 53,000. The government has a considerable trade in minerals, cereals, and lumber, and is well provided with railways. There is also considerable shipping on the Dnieper. Ekaterinoslav was created a government in 1802, and until 1887 comprised also the territory along the northeastern end of the Sea of Azov, now included with the province of Don Cossacks. Population, in 1897, 2,113,674, composed mainly of Little Russians, but including also Great Russians, Greeks, Jews, Armenians, Rumanians, Poles, etc. Capital, Ekaterinoslav (q.v.).

EKERÖ, ĕk'*e*-rẽ, or **ECKERÖ**. One of the Åland Islands (q.v.), Finland, at the entrance to the Gulf of Bothnia. It lies west of Åland and occupies an area of over 32 square miles. Its population is about 1200, mostly Swedes.

EKHMIM, ĕᴋ-mēm'. See AKHMIM.

EKHOF, or **ECKHOF**, ĕk'hôf, KONRAD (1720-78). A distinguished German actor and playwright, one of the creators of the modern German drama. Born amid humble surroundings at Hamburg, he became in his youth a lawyer's clerk, and while in this situation he made assiduous use of his master's library and resolved to become an actor. His début was made in a traveling company at Lüneberg, as Xiphares in Racine's *Mithridate*, the German stage being then largely dominated by French influence. He played in various German cities and gained a considerable reputation. In 1764 he went to Hamburg, and soon became a member of the national theatre there. In 1769 he went to Hanover, and five years later became director of the Court theatre of Gotha, where he remained till his death. He was a powerful actor, winning the admiration of such men as Iffland and Lessing. He was also the author of poems and of several adaptations from the French drama, notably *Die Mütterschule* (1753) and *Die wüste Insel* (1762). Consult Uhde, "Konrad Ekhof," in *Der neue Plutarch* (Leipzig, 1877).

EKKEHARD, ĕk′ke-härt. An important historical romance dealing with the tenth century, by Scheffel, published in 1855. It is based on researches in the chronicles of the monastery of Saint Gall, and describes the love of the monk Ekkehard for Hadwig, Duchess of Swabia.

EKKEHARD, Aura von (?-c.1125). A German historian. He was appointed abbot of the monastery of Aura, near Kissingen, about the beginning of the twelfth century, and published an admirable history of the first crusade, *Hierosolymita*. His *Chronica Ekkhardi Uraugiensis* was published by Waitz in *Monumenta Germaniæ Historica*, vol. vi. (Berlin, 1883).

EK′RON (Heb. *'eqrōn*, probably connected with *'āqār*, Ar. *'āqira*, sterile). The most northerly of the five cities of the Philistines (Joshua xiii. 3). It was assigned to Judah (Joshua xv. 45), but afterwards given to Dan (Joshua xix. 43). After Joshua's death Judah again possessed it. (Judges i. 18). In the wars with the Philistines it played an important part (I. Sam. v. 10; xvii. 52). The name occurs in the lists of towns conquered by Thothmes III. (c. 1500 B.C.) and also in the records of Sennacherib (B.C. 701), who refers to the revolt of Ekron and to its joining Hezekiah in an uprising against Assyria, although Padi, the King of Ekron, held aloof from the revolt. In the post-exilic period it appears as a place given by Alexander Balas to Judas Maccabæus in reward for his services (I. Macc. x. 89). The site has been identified with Akir, a railroad station between Jaffa and Jerusalem.

E′LÆAGNA′CEÆ. See Elæagnus.

E′LÆAG′NUS (Neo-Lat., from Gk. ἐλαιαγνος, *elaiagnos*, ἐλέαγνος, *eleagnos*, sweet gale, myrica, from ἐλαία *elaia*, olive-tree + ἄγνος *agnos*, tree like a willow). A genus of dicotyledonous plants, of the natural order Elæagnaceæ. This order consists of trees and shrubs, usually covered with scurfy scales, and having alternate or opposite entire leaves, without stipules. There are only about a dozen species of this order, all natives of the Northern Hemisphere, but found both in its warm and cold regions. The buffalo-berry (*Shepherdia argentea*), a North American shrub of this order, yields a pleasant fruit. The sallow thorn is the only British species. The oleaster (*Elæagnus angustifolia*), sometimes called wild olive, a native of the south of Europe and the Levant, is a spiny tree of 15 to 20 feet in height, with lanceolate leaves, which, as well as the young shoots, are hoary with stellate hairs. It is frequently planted for the sake of its silvery-white foliage, and its very fragrant small yellow flowers. The oleaster has been introduced into the United States as an ornamental, and has proved satisfactory even in Minnesota and South Dakota. Silver-berry (*Elæagnus argentea*), so called on account of the silvery-white scales that cover the leaves, is a common shrub from Canada to Utah. The berry is edible. A number of Japanese species are evergreen, and are cultivated as ornamentals, but they are not hardy except in the south. The berries of many species are edible.

ELÆ′IS. See Oil-Palm.

E′LÆOCOC′CA (Neo-Lat., from Gk. ἐλαία, *elaia*, olive-tree + κόκκος, *kokkos*, grain, seed). A genus of plants of the order Euphorbiaceæ, the seeds of some of which yield useful oils. The oil obtained from *Elæococca verrucosa* is used for food in Japan, notwithstanding its considerable acridity. The tree is cultivated in the Mauritius, and the oil is there used only for burning. That obtained from *Elæococca vernicia* is used in China for mixing paint. The species of this genus are now generally referred to Aleurites. The candlenut or candleberry-tree (*Aleurites triloba*) is widely distributed in tropical regions, and *Aleurites cordata* of Japan is one of the trees that yield, by the agency of the lac-insect (*Casteria lacca*), the lac of commerce. Both *Elæococca verrucosa* and *Elæococca vernicia* are now grouped together under the name *Aleurites cordata.*

E′LÆODEN′DRON (Neo-Lat., from Gk. ἐλαία, *elaia*, olive-tree + δένδρον, *dendron*, tree). A genus of trees of the natural order Celastraceæ. *Elæondendron glaucum*, a native of Ceylon and the south of India, is sometimes called the *Ceylon tea-tree*, from the resemblance of its leaves to those of the tea-shrub. The fine-grained, hard and tough timber of saffronwood (*Elæodendron croceum*) of the Cape of Good Hope, is much used in building and cabinet-making. The fruit of some South African species is eaten by the colonists. That of *Elæodendron argan*, or *Argania sideroxylon*, yields an oil similar to olive oil, which is much used by the Moors. See Argan.

EL′AGAB′ALUS, incorrectly **HE′LIOGAB′ALUS** (204-222). Emperor of Rome from 218 to 222. He was born at Emesa, Syria, and his real name was Varius Avitus Bassianus, but having, when a mere child, been appointed high priest of the Syro-Phœnician sun-god Elagabal, he assumed the name of that deity. Soon after the death of his cousin Caracalla, Elagabalus was proclaimed emperor by the soldiers, in opposition to the legitimate sovereign, Macrinus, who had become obnoxious to the troops from the severity of his discipline. The rivals met in battle at Antioch in A.D. 218. Macrinus was defeated, and Elagabalus quietly assumed the purple. His reign, which lasted rather more than three years and nine months, was infamous for the almost unparalleled debaucheries in which he indulged. He was murdered in an insurrection of the prætorians on March 11, A.D. 222, and was succeeded by his cousin and adopted son, Alexander Severus.

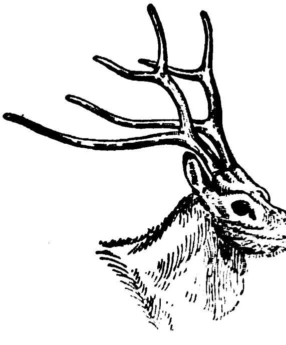
ELAINE, ê-lān′. A favorite woman's name in the Arthurian legends. (1) The half-sister of Arthur, who bore his illegitimate son, Modred. (2) King Pelles's daughter, who bore Sir Galahad, Launcelot's son. (3) The maid of Astolat, who died for love of Launcelot, and whom Tennyson has celebrated in the poem *Elaine*. (4) The daughter of King Brandegoris, who had a child by Sir Bors de Ganis. (5) Launcelot's mother, the wife of Ban of Brittany.

ELAIOPLASTS, ê-lī′ô-plăsts (from Gk. ἐλαία, *elaia*, olive + πλαστός, *plastos*, formed, from πλάσσειν, *plassein*, to shape). Protoplasmic bodies, containing imbedded oil-drops, which occur in the epidermis of various lilies and orchids. They are believed by their discoverer, Wakker, to have the function of accumulating oil, in much the same fashion as the leucoplasts accumulate starch. See LEUCOPLASTS.

E′LAM. A country including the high plateau traversed by the Zagros and Pushti chains and the great plain east of the lower Tigris and north of the Persian Gulf. It corresponded in a general way to the modern Khuzistan, in part to the Susiana and Elymaïs of the Greek classical writers. The name is derived from the Assyrian Ilamtu, 'the highlands,' and seems to be a translation of the Sumerian Nimma. The native designation appears to have been Shushunka-Anshan. Shushunka was the source of the Greek name Susiana, and denotes the territory ruled from the capital Shushan. (See SUSA.) Anzan or Anshan is a more ancient native name, and indicates the region subject to the city of Anzan. The situation of this city has not yet been identified. It is, therefore, uncertain whether the original kingdom of Anshan is to be sought north or southwest of Susa. In later times it seems to have been used of the whole territory. Cyrus apparently reigned in Susa as king of Anshan. The Greek Elymaïs was derived from the Semitic name and was probably identical with Susiana. From the highlands descended the great rivers of Elam, the Karun (Ululai, Eulaios), the Kercha (Uknu, Choaspes), and others. The valleys were exceedingly fertile, while in the southwestern plains the heat may not have been so intense in ancient times as at present. As to the ethnic relations of Elam in antiquity, our knowledge is yet quite scanty. It is impossible to determine how long those races have been in the land that are found there to-day. The negroes may be a comparatively late importation. Recent research renders it probable that the Aryans were in the land at a much earlier date than has been supposed. Inscriptions that have just been discovered seem to show the presence of a Semitic contingent before the time of Hammurabi. Turanian elements are more likely to have found their way into the country in the last thousand years than in earlier periods. The mass of the people seems to have belonged to the large family of nations of which the people of the Caucasus are the present representatives. This is shown by the often very striking similarity between the Elamitic dialects and the Georgian, Udic, Guric, and Sassanian languages. The dialects in which inscriptions have been preserved are: (1) The Old Elamitic; (2) the New Elamitic of the Achemænian period; (3) the Mal Amir dialect. A fourth dialect, the Kashite, is known through Babylonian inscriptions. Besides, there is an inscription found at Susa that may be Iranian. Partly through these records and partly through foreign sources light is thrown upon certain periods of the history of ancient Elam. Idingiranagin of Lagash (c.4100 B.C.), Alusharshid of Kish (c.4000 B.C.), and Shargan Sharali of Agade (c.3800 B.C.) claim Elam among their conquests; and Gudea of Lagash (c.3300 B.C.) and Ini Sin of Ur (c.2500 B.C.) refer to their having taken the city of Anshan. Kudur-Nanchundi I. is the first known king. He conquered Babylonia in B.C. 2285. Simti Shilchak was his successor. Kudur Mabuk, prince of Yamutbal, an Elamitish principality between the Pushti Kuh and Jebel Hamrin, styles himself "father of Martu" (probably Syria). His son Rim Sin was vicegerent in Larsam until he was conquered by Hammurabi (c.2240-2186 B.C.). A Kushite chief, Gandesh, invaded Babylonia and founded a powerful dynasty there (c.1700 B.C.). Churbatila of Elam fought with Kurigalzu II. of Babylon (1338-1283 B.C.), and was taken captive at Kar Dungi. After this Babylonian conquest of Susa, Inshushinak, his son Shatrak Nanchundi, and grandson, Shilchak Inshushinak, seem to have reigned. Nabukuduruzar I. (B.C. 1139-1123) and Marduknadinachi (B.C. 1116-1102) fought with Kashi and Elam, as did also Shamshi Adad II. (B.C. 825-812) and Adadnirari III. (B.C. 812-783), who conquered Illip (northeast part of Elam) and Umliash (between Jebel Hamrin and the Euphrates). Owing to the frequent references to Elam in the Assyrian inscriptions from the time of Tiglathpileser III. to that of Asurbanipal, it is possible to give an approximately correct list of kings with their dates for a hundred years: Chumbanigash (B.C. 742-717), Shutruk Nanchundi (B.C. 717-699), Challudash (B.C. 699-693), Kudur Nanchundi III. (B.C. 693-692), Chumbaminanu (B.C. 692-689), Chumbachaldash I. (B.C. 689-681), Chumbachaldash II. (B.C. 681-675), Urtaki (B.C. 675-664), Tammaritu I. (B.C. 664-657), Tiumman (B.C. 657-655), Tammaritu and Chumbanigash (B.C. 655-648), Indabigash (B.C. 648), Chumbachaldash III. (B.C. 647), Tammaritu II. and Chumbachaldash III. (B.C. 647-642). The long struggle between Elam and Assyria, during which Sennacherib was humiliated in B.C. 694 by Challudash, who carried away his son Asurnadinshum from Bablyon, and in B.C. 690 by Chumbaminanu, who probably won the battle of Chaluli, led to the imposition of Assyrian suzerainty in B.C. 655, and the final destruction of the State in B.C 642, when Susa was razed to the ground, and thirty-two statues of kings and all the images of the gods were carried away to Nineveh. How long the Assyrians were able to maintain their power in Elam is not known. Jeremiah xlix. 35-39 cannot be quoted to show the condition in the time of Nebuchadnezzar, for this prophecy was written at the end of the Achemænian period and Elam stands for Persia. Media under Cyaxares and Astyages claimed suzerainty over Elam. But the Apirti kings whose inscriptions have been found at Mal Amir seem to have been quite independent in the beginning of the sixth century, and the same is probably true of Teispes, Cyrus I., Cambyses I., and Cyrus II. as kings of Anshan. Isaiah xxi. 1 sqq. was apparently written between B.C. 549 and B.C. 539. In the Achemænian period Elam was loyal to Cyrus, Cambyses, and Smerdis, rebelled against Darius, but remained a favored satrapy, whose capital was one of the residence cities of the kings. For the recent excavations in this city see Susa.

Bibliography. Loftus, *Travels and Researches in Chaldea and Susiana* (London, 1857); Oppert, *Les inscriptions en langue susienne* (Paris, 1873); Weissbach, *Die Achämeniden-Inschriften der zweiten Art* (Leipzig, 1890); Sayce, *Inscriptions of Mal Amir* (Leyden, 1885); Billerbach, *Susa* (Leipzig, 1893); Jane Dieulafoy, *La Perse, la Chaldée et la Susiane* (Paris, 1887); Marcel Dieulafoy, *L'acropole de Suse* (Paris, 1893); Heinrich Winkler, *Ueber die Sprache der zweiten Columne der Achämeniden-Inschriften* (Breslau, 1896); Hüsing, *Elamische Studien* (Berlin, 1898).

ELAND (Dutch, elk, Ger. *Elend*, Lith. *élnis*, stag, Gk. *ἐλλός*, *ellos*, fawn). The largest of African antelopes (*Orias canna*). It is so bovine in general appearance that it was at once called 'elk' by the Dutch pioneers of South Africa, and the males and females are yet spoken of as bull and cow. It is as large as a tall horse, well-grown examples reaching six feet in height, and weighing sometimes as much as 1500 pounds, though the average weight does not exceed 1000 pounds. The massive form is shown in the illustration on the Plate of Antelopes. The usual color is a bright rich fawn, with the hair short and smooth; but in age the bulls lose much hair, so that the blue tint of the skin shows beneath it. A broad, deep-fringed dewlap reaches to the knee. The horns are very strong, rise straight upward, with considerable spreading, and are about twenty-eight inches long in large bulls, and a little longer, but more slender, in the cows. The flesh is exceedingly good eating (except in the dry season), and the hide of much value for harness, etc.; moreover, their gentleness, weight, and consequently their comparative slowness, with their habit of moving in herds, make them a comparatively easy prey. Hence the eland was practically exterminated from South Africa by 1890, and those of Central Africa were nearly swept away by rinderpest a few years later. Very few are left even in the remotest districts. Many examples have been kept in captivity and found amenable to domestication. Native names were canna and impoofo. In western equatorial Africa a second and considerably larger species (*Oreas Derbianus*) still exists in large numbers.



ANTLERS OF ELAPHURE.

ELANSK, *ye*-länsk′. A town in Russia. See Yelansk.

EL′APHURE (from Gk. *ἔλαφος*, *elaphos*, stag + *οὐρά*, *oura*, tail). A book name for David's deer (*Cervus Davidianus*) of northern China and Manchuria. It is frequently kept in parks by Chinese nobles, and has been similarly kept alive in Europe, but in regard to its wild habits little is known. It is of the rucervine type, resembles in size and form the Indian swamp-deer (q.v.), but has long shaggy hair. It is peculiar in having no brow-tine to the antlers.

ELAP′IDÆ (Neo-Lat. nom. pl., from Lat. *elaps*, *elops*, Gk. *ἔλλοψ*, *ellops*, sort of sea-fish). A family of proteroglyph venomous terrestrial serpents, the coral-snakes and their allies, with grooved fangs. Elapidæ of moderate size and great beauty are found in America (genus Elaps), in Africa (genus Microsoma), and in Australia (genus Vermicella). The American species inhabit the tropics, except three species in the southern United States. See Coral-Snake.

EL-ARABAH, ĕl-ä′rȧ-bȧ, Wadi. A portion of the depression or 'rift' valley which extends from the foot of Mount Hermon southward to the Gulf of Akabah, at the head of the Red Sea. It is one of the most remarkable depressions on the globe, being 682 feet below sea-level at the Sea of Galilee and 1292 feet at the Dead Sea. About six miles south of the Dead Sea it is crossed by a line of chalk cliffs, and the valley north of this point in now named El-Ghôr. The southern part of the valley, which still bears the Hebrew name El-Arabah, is about 100 miles in length and from three to twelve miles in breadth. See Arabah.

EL-ARAISH, ĕl-ȧ-rīsh′. See Larash.

EL-ARISH. An Egyptian city and fortress on the Mediterranean, and on the Wadi el-Arish, which marks the Palestine frontier. It had (1897) 17,000 inhabitants, and forms a governorship. In the middle ages the city was known as Laris. King Baldwin I. of Jerusalem died there in 1118. The French under Kléber took it in 1799, but were obliged to abandon it the same year.

EL′ASIP′ODA. See Holothurian.

ELASMOBRANCHII, ē-lăs′mō-brăŋ′kĭ-ī (Neo-Lat. nom. pl., from Gk. *ἐλασμός*, *elasmos*, metal plate + *βράγχια*, *branchia*, gills), or Chondropterygii. A group of fishes whose skeleton consists of cartilage and connective tissue alone, there being no distinct bones present, comprising only the sharks, rays, and chimæras. The cranium is composed of a single piece, without sutures and separate parts as in the higher vertebrates. The skin is in nearly all cases provided with placoid scales. The males in the recent forms have the ventral fin modified into copulatory organs known as 'claspers.' The caudal fin is heterocercal. The gill-slits, five to seven in number, open directly to the exterior (except in the chimæras), and the gill-filaments are fastened for their whole length to the interbranchial partitions. The intestine has a spiral valve, a fold of its wall into the interior arranged in a spiral fashion. No swimming bladder is present. The eggs are large and few in number, and are fertilized inside the body of the mother, where, in many cases, they undergo development. The two main groups, namely, the *Selachii*, which comprises the sharks and rays, and the *Holocephali*, or chimæras, include, besides the many living, many extinct forms, our knowledge of which (the skeleton being cartilaginous and therefore not preserved) is derived from fossilized teeth and dermal scales. Fossil remains of the Selachii first appear in the Upper Silurian, and throughout the Paleozoic times are very abundant. The Holocephali appear first in the Lower Jurassic, a few probable remains having been found in the Upper Silurian. It is among the elasmobranchs that we find the most primitive type of fishes. One of these more generalized primitive groups, the Cestracionts, (q.v.) abundant in Paleozoic times, is represented to-day by two or three species of Port Jackson sharks (q.v.). None of the elasmobranchs are very small, and among them are some of the largest of aquatic vertebrates. There are about 300 living species, all marine.

ELAS'MOSAU'RUS (Neo-Lat., from Gk. *ἐλασμὸς*, *elasmos*, metal plate + *σαῦρος*, *sauros*, lizard). A gigantic aquatic reptile of the order Sauropterygia, one of the few American representatives of the European plesiosaurs. Remains of this sea-serpent have been found in the Cretaceous deposits of New Jersey. It resembled the plesiosaurs in shape, but had a flattened tail. See PLESIOSAURUS.

ELAS'MOTHE'RIUM (Neo-Lat., from Gk. *ἐλασμὸς*, *elasmos*, metal plate + *θηρίον*, *thērion*, wild beast). An extinct fossil rhinoceros of gigantic size, found in the Pleistocene deposits of Siberia and Russia. See RHINOCEROS.

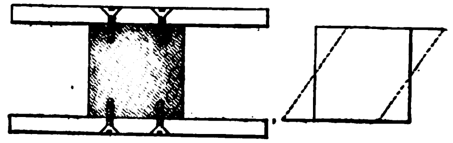
ELASTICITY (from Gk. *ἐλαύνειν*, *elaunein*, to drive, set in motion). A general property of matter (see MATTER) in virtue of which, if it is strained in any way by means of a force, it returns to its former condition more or less perfectly when the force is removed.

SOLIDS. A solid body is distinguished by having under ordinary conditions a definite volume and shape, both of which may, however, be altered by the application of suitable forces. In general, when a solid is deformed in any way—e.g. bent, stretched, etc.—any small portion of it has both its size and shape changed. To secure a strain of the solid such that each minute portion preserves its shape and suffers a change in volume only, it is necessary to apply a uniform pressure, i.e. a uniform force per square centimeter, over the whole surface of the solid, thus compressing it equally in all directions. This can be done by immersing the solid body in some liquid—e. g. water—which can be put under a great pressure. Let the original value of the volume be v and of the pressure be p; then if, as the result of increasing the pressure by a small amount Δp, the volume is decreased a small amount Δv, the 'coefficient of elasticity for a change in volume'—or the 'bulk-modulus'—is defined to be

$$k = \frac{\Delta p}{\frac{\Delta v}{v}}$$

The ratio $\frac{\Delta v}{v}$ is called the 'strain'; and Δp, the change in the force per square centimeter, equals what is called the 'stress.' 'Stress' is the alteration in the pressure of the portions of the solid on each other, i.e. it is an *internal* property. It is measured, however, by the external force producing the deformation; because, when this force is applied, the body is compressed and there are forces of restitution produced which oppose the applied force and exactly balance it when there is no further compression. For any one substance, e.g. a definite kind of glass or iron, k is a constant quantity.

To produce a change in the shape of minute portions of a solid without sensibly altering their volumes, it is necessary to apply what is called a 'shearing' stress, i.e. a combination of forces like that due to a pair of shears when used in cutting a piece of paper or cloth. Thus, if a cubical block of wood is held between two boards firmly screwed to it, and if the boards are pushed slightly sidewise, but in *opposite* directions, the upper one to the right and the lower to the left, the block will have its shape changed to an oblique solid, as indicated in exaggerated form in the diagram, while the change in the volume will be infinitesimal. The angle through which the edge of the block is turned is taken as the measure of the strain; and the stress equals the force used to push one of the boards sidewise divided by the area of the cross-section of the block. This stress is an internal force, being due to the reaction of the solid against the shearing forces which tend to make one layer of the solid move over the other. When there is no further alteration under the action of these external forces, they must be exactly equal and opposite to the internal forces of restitution. Calling this ratio of the force to the area T, and the angle of the strain I, the coefficient of elasticity for a change in shape—or the coefficient of rigidity—is defined as



$$n = \frac{T}{I}$$

The simplest case in practice of a pure change in shape is when a wire or rod is twisted slightly round its axis of figure; this is called 'torsion.' It can be shown from theoretical considerations that if a wire or rod with a circular cross-section is clamped at one end and the other end twisted around the axis through an angle ψ, a moment will be required equal to

$$\frac{\pi r^4 n \psi}{2 l}$$

where r is the radius of cross-section and l is the length of the wire. It is found that for any definite kind of matter, regardless of its size or shape, n is a constant quantity.

By far the commonest deformation of a solid is that experienced when a rod or beam is stretched, compressed, or bent. In all these cases it is evident that it is simply a matter of changing the length of the rod or beam, or of certain portions of it. Thus, if a wire of cross-section A and of length L is clamped at one end and under the stretching force F is elongated by an amount l, the strain is defined to be l/L and the stress equals F/A. This stress, although measured by the applied force, is the internal reaction. The ratio of these two, viz.:

$$E = \frac{\frac{F}{A}}{\frac{l}{L}} = \frac{FL}{Al}$$

is called 'Young's modulus' because its importance was first emphasized by Thomas Young. In this deformation both the size and shape of the small parts of the wire are altered; and therefore Young's modulus must depend upon both the bulk-modulus and the coefficient of rigidity. Calling Young's modulus E, it may be shown theoretically that

$$\frac{1}{E} = \frac{1}{9k} + \frac{1}{3n}$$

Solids differ greatly in their compressibility and in their rigidity; and they differ widely in the extent to which they may be deformed and yet recover their former shape and size when released from the deforming forces. If the strain is too great, the body does not regain its former condition; the 'limits of elasticity' are said to have been passed. A body is called 'elastic' if these limits permit a large strain—e.g. glass, steel; while if these limits permit only small or minute strains, the body is said to be 'inelastic.' If, however, the strain is small enough solids do return quite exactly to their former states; and for such small strains it is observed that the amount of the deformation produced varies directly as the deforming force. This is called 'Hooke's law,' from the name of the one who first proposed it, Robert Hooke. Many solids after being strained return to their previous condition slowly after the deforming force is removed; and nearly all take considerable time to reach their permanent strain when a force is applied. There is therefore a slight molecular 'slipping' in general in every deformation of a solid; this necessarily involves internal friction and the production of heat effects—in particular, rise in temperature. A 'perfect' solid might be defined as one in which there is no internal friction; while the more inelastic a body is, the greater are the slipping and the internal friction when there is a deformation.

Since solids have, in general, elasticity both as to change in volume and as to change in shape, a solid medium can transmit two kinds of waves, compressional and transverse. (See WAVES.) A solid rod, too, can vibrate in several ways: longitudinally, if it is stroked lengthwise; torsionally, if it is twisted; from side to side, like a tuning-fork, if it is bent.

FLUIDS. A fluid is defined to be such a form of matter as will yield to a shearing force, however small. Thus it is necessary to discuss the elasticity of fluids with reference to changes in volume only. As before, the definition of the coefficient of elasticity is

$$k = \frac{\Delta p}{\frac{\Delta v}{v}}$$

where v is the original volume, and Δv is the decrease in the volume accompanying an increase in the internal pressure of an amount Δp. For liquids k is very large, since they are so slightly compressible; for a gas, however, it is much smaller. When any portion of matter is compressed, the temperature is increased (except in most special cases); and this fact alters the value of the change of pressure corresponding to a definite change in volume. If the change in volume is to be due to the change in pressure alone, it is necessary to change the volume so slowly that the temperature remains practically constant. This fact is of particular importance in the case of gases, because they are so easily compressed and there is accordingly such a great rise in temperature unless care is taken. If the gas is compressed so suddenly that the whole change in volume takes place before there is time for any loss of heat by radiation or conduction, the temperature will rise greatly, and this will produce a marked increase in the pressure of the gas, thus increasing the coefficient of elasticity for the gas.

The coefficient for a gas, when there is no change in temperature, may be calculated from Boyle's law for a gas, which states that as long as the temperature of a gas does not change, the product of its pressure and volume remains constant, however the volume is altered. Thus, if v is the volume of the gas when the pressure is p, and $v - \Delta v$, the volume when the pressure is increased to $p + \Delta p$, then

$$pv = (p + \Delta p)(v - \Delta v) = pv - p\Delta v + v\Delta p,$$

if Δp and Δv are so small that their product may be neglected. Hence $p\Delta v = v\Delta p$ and therefore

$$k = \frac{\Delta p}{\frac{\Delta v}{v}} = p.$$

In words, the coefficient of elasticity for a gas at constant temperature numerically equals its pressure. If, however, the change in volume is made so rapidly that the heat produced has no time to escape, the coefficient equals γp, where γ is a constant for any one gas, being equal to the ratio of the specific heat at constant pressure to that at constant volume. (See HEAT.) For air, hydrogen, and oxygen γ very nearly equals 1.4.

A fluid medium can transmit compressional waves only; and in these the vibrations must be rapid, otherwise the fluid would flow round the vibrating body which is the cause of the waves. Therefore, the elasticity which is called into play is the one corresponding to no escape of heat.

Solids

	k	*n*	*E*
Glass	4.1×10^{11}	2.4×10^{11}	
Brass	10.6×10^{11}	8.8×10^{11}	11×10^{11}
Steel	18.8×10^{11}	8.2×10^{11}	20×10^{11}

Liquids

	Temperature	*k*
Water.....................	8° C.	0.22×10^{11}
Sulphuric Ether.....	10° C.	0.07×10^{11}

Gases

At pressure of 76 cm. of mercury.

$$\overset{k}{1.01 \times 10^{6}}$$

Consult Love, *Treatise on the Mathematical Theory of Elasticity* (Cambridge, Eng., 1906).

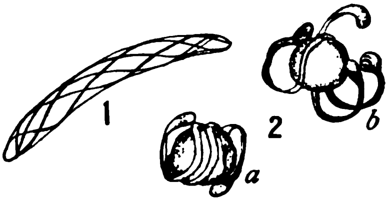
ELASTIC LIMIT. See STRENGTH OF MATERIALS.

ELASTIC TISSUE. One of the forms of fibrous tissue, known also as yellow fibrous tissue. It derives its name from the remarkable physical property which it possesses of permitting its fibres to be drawn out to double their length, and again returning to their original length. It occurs in various ligamentous and other structures of the animal body in which elasticity is required, as in the vocal cords, the membranes connecting the cartilaginous rings of the trachea, the middle coat of the arteries, the skin, etc.

ELASTIN (from *elastic*). A characteristic chemical constituent of the substance of all elastic fibres of the animal body. It may be prepared from the ligamentum nuchæ of an ox by boiling with water, next heating with weak caustic potash solution, and further will dilute acetic acid; the substance thus obtained is treated with cold dilute hydrochloric acid, then boiled with strong alcohol, and finally subjected to prolonged and careful treatment with ether. In this manner gelatin, mucin, fats, etc., are removed from the tissue, the elastin remaining behind in the form of a yellowish powder which is elastic when moist, but becomes brittle on drying. By the action of strong hydrochloric acid and chloride of zinc, elastin is converted into several substances, including a small quantity of tyrosin and glycocoll; gelatin, if subjected to similar treatment, yields no tyrosin, while the true proteids yield no glycocoll and do yield glutamic and aspartic acids, which are not produced in the treatment of elastin. By means of the reaction just mentioned, elastin can, therefore, be readily distinguished from gelatin and the proteids. On the other hand, elastin may be distinguished from keratin by the action of pepsin or trypsin, which readily dissolve elastin, while they have no effect on keratin.

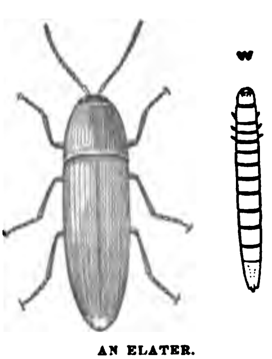
EL'ATE'A. See CITHÆRON.

EL'ATER (Neo-Lat., from Gk. *ἐλατήρ*, *elatĕr*, driver, from *ἐλαύνειν*, *elaunein*, to drive). In plants, a peculiarly modified cell developed in great numbers in the spore-cases of certain liverworts, as Marchantia. The cells occur among the spores, and have the form of elongated fibres, with spiral thickened bands. When the spore-case bursts, the elaters ('jumpers') bend and straighten by jerking motions and help to scatter the light spores. The name elater is also applied to the hygroscopic spiral bands on the spores of Equisetum. See HEPATICÆ; EQUISETUM.



ELATERS:
1, of a liverwort; 2, of Equisetum.

EL'ATER'IDÆ (Neo-Lat. nom. pl., from Gk. *ἐλατήρ*, *elatĕr*, driver). A large family of beetles, commonly known as elaters or click-beetles. About 7000 species are described, of which over 500 occur in the United States. The most conspicuous North American one is the eyed elater (*Alaus aculatus*), which has two large velvety spots on the prothorax. See CLICK-BEETLE and WIREWORM.



AN ELATER.
Adult beetle and larva—a wireworm (*w*).

ELAT'ERIN (from *elaterium*), $C_{20}H_{28}O_5$. A neutral principle contained in elaterium (q.v.), from which it may be prepared by exhausting with chloroform, precipitating the resulting solution with ether, and purifying the precipitate by re-crystallization from chloroform. Elaterin is a permanent white substance crystallizing in the form of small hexagonal scales, or in the form of prisms. It has no odor, but a bitter, slightly acrid taste. It is but very sparingly soluble in alcohol and in ether, and is practically insoluble in water. The triturate of elaterin is an official preparation, and is the most powerful hydragogue purgative known. It may be used, with great caution, in Bright's disease and in ascites. See ELATERIUM.

ELAT'ERITE. A soft, elastic variety of asphalt, resembling india-rubber. It is subtranslucent, has a brownish color and a specific gravity, varying from 0.9 to 1.0. It is found in Derbyshire and elsewhere in England.

EL'ATE'RIUM (Neo-Lat., from Gk. *ἐλατήριος*, *elatĕrios*, driving, from *ἐλατήρ*, *elatēr*, driver, from *ἐλαύνειν*, *elaunein*, to drive). A substance obtained from the fruit of the squirting cucumber (*Ecballium elaterium*), also called the wild cucumber. The plant is an annual of the order Cucurbitaceæ, a native of the south of Europe, common on rubbish in the villages of Greece and the Archipelago. The whole plant is rough, with stiff hairs; it has a trailing branching stem, without tendrils; the leaves are heart-shaped, somewhat lobed and toothed, on long stalks; the flowers axillary, yellow, the male flowers in small racemes; the fruit oblong, about an inch and a half long, grayish green, covered with soft prickles, and finally parting from its stalk, and expelling its seeds along with a thin mucus through the aperture where the stalk was inserted. It is this mucus surrounding the seeds—a thick green mucus of a very peculiar character—which contains the elaterium. To obtain the latter, the juice of the nearly ripened fruit is allowed to stand for a short time, when it becomes turbid and deposits a sediment. The sediment, carefully collected and dried, is elaterium. It is of a pale grayish-green color, light and friable, with an acrid taste, and a peculiar not unpleasant odor. Its powerful purgative action seems to depend chiefly on a principle called elaterin (q.v.).

E'LATH. The modern Akabah, a seaport situated in the extreme south of Idumæa, at the head of the Gulf of Akabah. According to Deut. ii. 8, it was one of the stations of the Israelites on the route from Egypt. It is probably a later designation of El-Paran (Gen. xiv. 6) and the same as Elah (Gen. xxxvi. 41). Other variant forms are Eloth and Elim. David captured it from the Edomites (II. Sam. viii. 14), and under Solomon it became an important naval station (I. Kings ix. 26). Edom recovered its independence in the days of Jehoram, but subsequently Elath passed once more into the possession of Judah (II. Kings xiv. 22); again in B.C. 734, in the days of Ahaz, it passed out of the hands of Judah, and this time permanently (II. Kings xvi. 6). In the days of Eusebuis Elath was a town of commercial importance and carried on trade with such remote regions as India. At present nothing remains of the ancient place but portions of the castle and heaps of ruins.

EL′BA (Gk. Αἰθάλεια, *Aithaleia,* Lat. *Ilva*). A mountainous, unwooded island of the Mediterranean, attached to the Tuscan Province of Leghorn, Italy, five and one-half miles southwest of Piombino (q.v.), with which it has steamboat communication twice daily (Map: Italy, E 5). It is eighteen miles long, from three to ten broad, and has an area of eighty-six square miles. The highest point is Mount Capanne, 3350 feet. The climate is mild and healthful and the soil is fertile, but farming is neglected and grain and meat have to be imported. From ancient times Elba has been famous for its iron ore, as is indicated by the name of the capital, Porto Ferrajo (iron port). Most of the inhabitants of the island (population, in 1881, 23,997; in 1901, 24,213) are employed in the iron industry. Other mineral products are copper, tin, lead, marble, granite, sandstone, and salt. Tunny and sardine fishing and the extraction of sea-salt are other important industries. To the world at large Elba is known as the residence of Napoleon after his first abdication, from May 4, 1814, to February 26, 1815, when he escaped and returned to France, landing at Cannes, March 1. He enjoyed full sovereignty over the island, with the title of Emperor and an income of 2,000,000 francs a year. During his stay he had the road built connecting Porto Longone with Porto Ferrajo. The villa San Martino that he occupied still stands in Porto Ferrajo between the forts Stella and Falcone, erected by Cosimo I., Duke of Florence. In the Middle Ages Elba was subject in turn to Pisa, Genoa, Sora, and Piombino. After Napoleon departed the island was restored to Tuscany. Consult: L. Simonin, *La Toscane et la mer tyrrhénienne* (Paris, 1868); Fatichi, *Isola d'Elba* (Florence, 1885).

EL-BASSAN, ĕl-bȧs-sän′. A town of European Turkey in the Vilayet of Monastir (Albania) on the Scumbi, 35 miles east of the mouth of the river (Map: Turkey in Europe, B 4). It stands in a fertile plain surrounded by mountains, is the capital of a sanjak, and the seat of a Greek bishop. There are a number of hot sulphur springs in the vicinity. It has manufactures of iron and copper wares. Population estimated at 10,000.

ELBE, ĕl′be (dialectic *Albe,* OHG. *Elba, Alba,* from OHG. *elf,* Icel. *elfr,* river; called by the Romans *Albis,* by popular confusion with *albus,* white, and by the Bohemians *Labe*). An important river of central Europe (Map: Germany, D 2). It originates in the confluence of numerous streams which rise at the southwestern base of the Schneekoppe, one of the highest summits of the Riesengebirge, a mountain range on the northeast border of Bohemia. Beginning near latitude 50° 45′ N. at an elevation of 4400 feet above sea-level, it has a total length of about 725 miles. Its basin is estimated at 56,500 square miles. Through most of its course the Elbe is less than 1000 feet wide, but at its long estuary-like mouth it has a width of several miles. From the base of the Schneekoppe it flows south to Pardubitz, thence west to Kolin, and then in a generally northwest direction past Melnik, where it is 425 feet wide and becomes navigable for small boats. At Tetschen it leaves Bohemian territory and enters Saxony. Its principal affluent in Bohemia is the Moldau.

On its way northwest through Saxony the Elbe passes Pirna (where it becomes navigable for quite large boats), Dresden, and Meissen. Entering Prussian Saxony, it passes Wittenberg, from which point it flows first west, then northwest to Magdeburg (where it has a width of 800 feet), having received the Mulde and the Saale, both from the south. From Magdeburg flowing northeast the Elbe arrives at the border of Brandenburg, receiving the Havel from the southeast. Turning northwest, it enters Hanover, through which it flows for about 30 miles. Then, still coursing northwest and past Hamburg and Altona, the Elbe empties into the North Sea at Cuxhaven, where it attains a breadth of about 10 miles, and where the tide rises 13 feet. Numerous islands divide the Elbe into several branches between Hamburg on the north and Harburg on the south. Ocean liners ascend to Hamburg. The scenery of the valley of the Elbe, though generally pleasing, is not remarkable in any portion of its course except that between Aussig and Dresden. Here the bold and picturesque cliffs and other beautiful landscape features have given the district the name of 'Saxon Switzerland.' The Elbe is stocked with fine fish. Its commerce is very extensive and important. Consult: Semmler and Münnig, *Der Elbstrom von seinem Ursprung bis zu seiner Mündung* (Dresden, 1845); Bose, *Allgemeine geographische und hydrotechnische Beschreibung der Elbe* (Annaburg, 1852); Nehls and Bubenderg, *Die Elbe* (Hamburg, 1852).

ELBE, AUGUSTE VON DER. See DECKEN, AUGUSTE VON DER.

ELBÉE, ĕl′bā′, MAURICE LOUIS JOSEPH GIGOT D' (1752-94). A Vendean general. He was born at Dresden and was of remote Scottish extraction. Upon the outbreak of the Revolution he was elected to the Constituent Assembly, but emigrated in 1791. He returned in 1792, and after the death of Cathelineau was proclaimed commander-in-chief of the 'Catholic and Royalist Army.' After winning a succession of brilliant battles he was captured by General Thureau, condemned to death by a council of war, and shot.

ELBERFELD, ĕl′bĕr-fĕlt. One of the most important manufacturing towns in Germany, situated on both sides of the Wupper, an affluent of the Rhine, in the Prussian Rhine Province, 16 miles east-northeast of Düsseldorf (Map: Germany, B 3). The old parts of the town are somewhat poorly built, with irregular streets, while the more recently erected portion is well built, with numerous spacious and imposing buildings. Among public edifices may be mentioned the Rathaus and the court-house. Many of the public squares are adorned with handsome modern monuments. Elberfeld is one of the chief centres of the textile industry in Germany. It has numerous establishments for the dyeing, weaving, and printing of cotton, silk, woolen, and mixed goods, and also manufactures of furniture, dyes, chemicals, iron and steel products, paper articles, carpets, and beer. Most of the textile industries of Elberfeld date from the eighteenth century. The commerce of the town is extensive and there are a number of financial institutions and consular agents from many foreign countries. Elberfeld is an important railway centre and has seven stations. Electric street railway lines traverse the town and connect it with the adjoining town of Barmen, while a suspended electric road follows the bed of the Wupper from Rittenshausen to Sonnborn. Eighteen bridges are thrown across the river to facilitate the immense traffic. Population, in 1890, 125,899; 1900, 157,927; 1905, 162,853. Elberfeld grew up about a castle belonging to the family of Elverfeld, erected in the Twelfth Century, but was afterwards united with the Duchy of Berg. It first obtained municipal privileges in 1610. Its industrial prosperity began in the latter part of the eighteenth century through the introduction of silk-weaving and Turkey-red dyeing. In 1815 it passed with Berg to Prussia.

ELBERFELD SYSTEM. The manufacturing town of Elberfeld, Prussia, has become famous for its plan of relieving the poor. The reform began in 1800, when, dissatisfied with existing conditions, the city appointed six visitors to investigate applications for relief. The visitors were increased to twelve the following year. In 1802 there was a great increase. The city was divided into eight districts and these districts into four sections, and a board of supervisors chosen. The system was further extended in 1841. In 1850, dissatisfaction having arisen in several quarters, the Lutheran Church attempted to do the work. Matters were not improved. In 1852 the present plan was proposed by a banker, Daniel von Heydt, and was put in operation. The city was divided into 364 precincts, and over each was placed an unsalaried almoner whose duty was to investigate each applicant for aid and to make visits every two weeks as long as aid was given. Fourteen precincts form a district. The almoners meet every two weeks under direction of an unpaid overseer to discuss the cases and to vote needed relief. These proceedings are reported to the directors, comprising the Mayor as ex-officio chairman, four councilmen, and four citizens (also unpaid), who meet the day following and review and supervise the work throughout the city. In emergency cases the almoner may furnish assistance. Relief is granted in money according to a fixed schedule for two weeks at a time, any earnings the family may have being deducted. Tools are furnished when advisable. The system has given great satisfaction; the expenses in proportion to the population have gradually decreased, and the condition of the poor is said to have improved. Seventeen persons out of 1000 population were assisted in 1855, seven in 1889. See Charity Organization Society; Pauperism.

EL′BERTON. A city and the county-seat of Elbert County, Ga., 34 miles east by north of Athens, on the Seaboard Air Line and the Southern railroads (Map: Georgia, D 1). It is in a cotton-growing region, and has a cotton-factory, cotton-compress, cottonseed-oil mill, fertilizer-factories, harness, carriage and wagon shops, iron-works, granite-quarries, etc. Population, 1900, 3834; 1906 (local est.), 5500.

ELBEUF, ĕl-bĕf′ (Lat. *Elborium*), or **ELBOEUF**. A manufacturing town in the Department of Seine-Inférieure, France, situated in a picturesque valley on the left bank of the Seine, 14 miles by rail from Rouen (Map: France, H 2). The two principal buildings are the churches of Saint Etienne and Saint Jean-Baptiste, both containing fine specimens of richly painted glass of the fourteenth and fifteenth centuries. There are numerous factories in Elbeuf, and the suburban communes of Saint Pierre-les-Elbeuf, Caudebec-les-Elbeuf, and Saint Aubin-Jouxte-Bouleng, principally of double-twilled and waterproof cloth, flannel fabrics, billiard-table covers, and light woolens of every color and description. Elbeuf has steam communication with Paris, Havre, and Rouen. The population in 1901 was 19,050. Elbeuf had 80 cloth manufactories as early as the sixteenth century. In consequence of the revocation of the Edict of Nantes, the greater number of the cloth manufacturers emigrated; and it was not till after the revolution of 1789, and more particularly since the separation of Belgium and France, that the industry revived.

ELBING, ĕl′bĭng. An important commercial town in the Prussian Province of West Prussia, on the navigable Elbing, about five miles from its mouth in the Frisches Haff, and 35 miles east-southeast of Danzig (Map: Prussia, H 1). It is connected by a canal with the Nogat, the eastern arm of the Vistula. The town was formerly surrounded by wall, of which, however, but few traces remain. Many of the buildings are picturesque, with overhanging gables. Among its manufactures are machinery, linen and cotton cloths, leather, tobacco, soap, and chicory. There are also oil-manufactories, iron-foundries, dye and print works, and the famous Schichau shipbuilding works for the construction of war-vessels, particularly torpedo-boats. Elbing has excellent railway facilities, is in steamboat communication with Danzig and Königsberg, and has an electric street railway. Population, in 1890, 41,576; in 1900, 51,510; in 1905, 55,657. Elbing was founded about the beginning of the Thirteenth Century by colonists from Lübeck and Bremen, who settled about the fortress erected by the Knights of the Teutonic Order. It early joined the Hanseatic League, but in 1454 came under Polish rule. It suffered severely from religious strife among its citizens and from the wars of Sweden, Poland, and Russia. In the first partition of Poland it was annexed to Prussia in 1772, and, after a period of decline, has again risen to a thriving condition.

ELBOW. See Arm.

ELBOW-PIECES, Coudières, or Coudes (Fr.). In mediæval armor, the metal plates used to cover the junction of the rere-brace and vantbrace, by which the upper half and lower half of the arm were covered. They were of three principal kinds; disk-formed, cup-formed, and articulated; and were sometimes armed with spikes. In the fifteenth century they were sometimes fan-shaped and of enormous size.

ELBRUZ, ĕl-bro͞oz′. The highest summit of the Caucasus Mountains (q.v.), and the loftiest peak in Europe (Map: Russia, F 6). It is situated in latitude 43° 21′ N. and longitude 42° 25′ E. It is an extinct volcano with two craters, the mountain mass being composed of trachyte. Its elevation is 18,470 feet above the sea.

ELBURZ, ĕl-bo͞orz′. A mountain range in northern Persia, extending from the boundary of Persia and the Russian Province of Transcaucasia southeastward along the shores of the Caspian Sea, changing its trend near the southern limit of the latter to northeast toward the frontier of Turkestan (Map: Persia, D 3). The range marks the limit of the Iranian Plateau toward the Caspian depression, and is a unit in the great mountain system that stretches from southern Europe eastward into central Asia. The northern slopes of the Elburz, receiving an abundant rainfall, are intersected by fertile valleys that support a rich tropical vegetation, while the interior slopes are generally dry and almost barren. A single river, the Kizil Uzen, crosses the range to enter the Caspian Sea. There are several passes, of which the most important are those connecting Teheran with Amol and Balfrush, near the centre of the range, and, farther westward, that between Kasbin and Resht. The Elburz has an average altitude of about 5000 feet, the highest peak being Demavend with an estimated elevation of 18,500 feet.

EL CANEY, ĕl kä'nȧ-ė. A town of Cuba, four miles from Santiago de Cuba (Map: Cuba, K 6). Here on July 1, 1898, during the Spanish-American War, occurred an engagement between about 520 Spaniards, intrenched, under General Vara del Rey, and about 4500 Americans under General Lawton. The Spaniards made a desperate resistance, but were finally overcome by the American infantry. The Americans lost 443 in killed and wounded and missing, the Spaniards 420 (including 100 prisoners). Consult: Lee, "The Regulars at El Caney" in *Scribner's Magazine*, vol. xxiv. (New York, 1898); Norris, "Battle of El Caney" in *The Century* (New York, 1899); and Bonsal, "Battle of El Caney," in *McClure's*, vol. xii. (New York, 1899).

ELCANO, ĕl-kä'nō, Juan Sebastian de (?-1526). A Spanish navigator and explorer. He was born at the seaport of Guetaria, in the Province of Guipúzcoa. As captain of the *Concepción*, he accompanied Magellan, and after the death of that officer (April 27, 1521), returned to Spain on the *Victoria* by way of the Cape of Good Hope, arriving September 8, 1522, at San Lucar, and thus, after an absence of more than three years completed for the first time the circuit of the globe. In 1525 he accompanied Garcia Jofre de Loaysa as chief pilot on the westward voyage to the Moluccas, but died after passing the Straits of Magellan and reaching the Pacific. In 1861 a bronze statue was erected to his memory at Guetaria. Consult "Discorso sobre Colón y Juan Sebastian de Elcano," in *Boletin de la Sociedad Geográfica de Madrid*, vol. vi. (Madrid, 1879).

ELCESAITES, ĕl-sēs'ȧ-īts. See Elkesaites.

ELCHE, ĕl'chȧ. A town in the Province of Alicante, Spain, 16 miles southwest of the city of Alicante; on the River Vinalapó, about two leagues from the sea, and on the Alicante-Murcia Railway (Map: Spain, E 3). The town is strikingly Oriental in appearance; its architecture in general has retained much of the Moorish character. Elche is well built and has several public squares, while it is partly surrounded by groves of date-palms. The Church of Santa Maria is an imposing edifice with a large dome and a tabernacle of precious marbles. Other important structures are the Casa Consistorial, bishop's palace, the hospital and barracks. The dates gathered from the palm plantation are exported in considerable quantities; also the palm branches, which are used for religious purposes. Pomegranates are extensively cultivated, and constitute another important article of commerce. The chief manufactures include woolens, articles of esparto grass, brandy, wine, oil, soap, leather, etc. Population, in 1900, 27,430. Elche, anciently called *Illici* or *Ilici*, was raised by the Romans to the dignity of a colony with the *jus Italicum*. It increased in importance under the Goths, as evidenced by its erection into an episcopal see, which, however, ended with the Moslem occupation. Excavations have brought to light objects of considerable archæological interest.

ELCHINGEN, ĕlk'ĭng-*e*n. A village of Bavaria near the left bank of the Danube, about five miles northeast of Ulm (Map: Germany, C 4). It is noteworthy for its celebrated mediæval Benedictine abbey, founded in 1128, and as the scene of a battle fought on October 14, 1805, between the French, under Ney, and the Austrians, under Laudon, which resulted in the defeat of the latter and the surrender of Ulm. Ney's victory obtained for him the title of Duc d' Elchingen.

ELCHO, Lord. See Wemyss, Ninth Earl of.

EL'DAD AND ME'DAD. (1) Two persons mentioned in Num. xi. 26-29 as prophesying, though not present with Moses and the seventy elders at the tent of the meeting when Jehovah gave His spirit. Joshua is said to have demanded that they be forbidden. But Moses himself is credited with a wish that all Jehovah's people were prophets. The story is held to belong to a late stratum of the Elohistic narrative, and to reflect a tendency to look with more generous sympathy upon men of the spirit condemned as false prophets in leading Ephraimitish circles, as is suggested by the hostile attitude ascribed to Joshua. The name of the second prophet is given as Modad by the Greek version. Both names are compounded with Dad, who may be identical with Hadad. In that case their meaning would probably be 'Hadad is my god' and 'Water of Hadad,' i.e. 'Seed' or 'Offspring of Hadad.' Targum Jonathan to Num. xi. 26 sqq. makes these prophets predict the death of Moses, the succession of Joshua to the leadership, the coming of the king of Magog, the victory over him, and the resurrection of Israel to take part in the meal when the bull Leviathan is to be served. The Fragment Targum makes Eldad and Medad prophesy the destruction of Gog and Magog through Messiah, the King.

(2) An apocalyptic work ascribed to Eldad and Medad is quoted in the *Shepherd of Hermas*, vis. ii. 3, 4. The quotation reads, "Near is the Lord to those who return." As Targum Jonathan quotes a similar expression of the two prophets, "Near is the Lord to those that are in the hour of need," it is not impossible that the author was familiar with the same work. In his *Chronographia Compendiaria*, Nicephorus gives a list of canonical and apocryphal books which contains this work and states that it has 400 stichi. This list is found also in the *Synopsis* ascribed to Athanasius. Lightfoot and Holtzmann think that the quotations in I. Clem. xxiii. 3, 4, and II. Clem. xi. 2, have been drawn from the same source. Consult: Fabricius, *Codex Pseudepigraphus Veteris Testamenti* (Hamburg, 1722); Holtzmann, *Einleitung in das Neue Testament* (Freiburg, 1892); Harnack, *Geschichte der altchristlichen Litteratur* (Leipzig, 1893); Zahn, *Geschichte des neutestamentlichen Kanons* (Leipzig, 1890-1892); Schürer, *Ge-*

schichte des jüdischen Volkes (3d ed., Leipzig, 1898); Funk, *Patres Apostolici* (Tübingen, 1901).

ELDAD HA-DANI, hȧ-dä′nē (ninth century). A Jewish traveler, who undertook two voyages for the purpose of tracing the history of the various tribes of Israel. He had many extraordinary adventures, which are recounted in a narrative afterwards translated into several languages, including English (1855).

ELDER (AS. *ealdor*, *aldor*, comp. of *eald*, *ald*, OHG., Ger. *alt*, old; connected with Goth. *alan*, Icel. *ala*, Lat. *alere*, to nourish, as an ecclesiastical title an exact translation of the Greek *πρεσβύτερος*, *presbyteros*, comparative of *πρεσβύς*, *presbys*, old, which occurs frequently in the New Testament). The title of an officer-bearer in certain churches. (1) In the Old Testament it is a title generally indicating in the earlier history the princes or heads of tribes and afterwards men of special influence, dignity, and authority in their local community. In the Hebrew polity, as shown in the New Testament, the elders are the lay element in the Sanhedrin. Originally in Jewish society, the head of the first house was also the head of the clan, that of the first clan also that of the tribe. All these three grades of the heads of the people might be designated by one common name, most frequently that of elder. (2) In the New Testament elder is also the title of certain officers in the newly organized society of Christians, whose functions are not clearly defined, but who apparently exercised a considerable control in the conduct of the local churches. Scholars are not agreed as to the limits or nature of their authority. The office of elder developed very generally in the churches of the Reformation. In most of the churches on the Continent of Europe which have any kind of connection with the State there is some regulation of the civil law with reference to the election and functions of elders. In some churches elders are appointed for a certain term of office; but more generally it is until death, resignation, removal from the bounds of the congregation, or deposition. The ordination of elders takes place in the congregation, but usually without the imposition of hands. In the Baptist churches the pastors of churches are usually called elders, although the class especially so called are not settled pastors, but rather evangelists and missionaries. In the churches of the Presbyterian order the pastor of a church is technically called the *teaching elder*, as distinguished from the *ruling elders*, commonly called simply elders, who are a body of laymen varying in number, selected to assist the pastor in the oversight and government of the church. The board of ruling elders constitute with the pastor the session of the church, and are intrusted with its government and discipline, subject to the supervision of the presbytery. Such elders are required to accept the symbol or confession of faith of the Presbyterian Church; they do not administer the Sacrament, but may aid in the Lord's Supper by distributing the elements. They are sometimes elected for life, sometimes only for a term of years. In the Reformed churches (Dutch and German) the consistories include the ministers, elders, and deacons, and the latter two classes of officers are elected only for a term, with permission of reëlection. In the early days of American Congregationalism many churches had in addition to a pastor and teacher a ruling elder charged with matters of church government and discipline. In some of the American Methodist churches elder is the general term for any clergyman. In the Methodist Episcopal Church the presiding elder is an ordained clergyman appointed by and serving under the bishop, with large supervisory powers within a specified district. He presides over the quarterly and district conferences and visits the churches. Traveling elders are itinerant preachers appointed by the annual conference. In the Mormon Church the elder is an officer whose duty it is "to preach and baptize; to ordain other elders, and also priests, teachers, and deacons, to lay on hands for the gift of the Holy Ghost, to bless children, and to take the lead at all meetings." These elders constitute the Melchizedek priesthood, and include the apostles, the seventy, the patriarchs, and the high priest. Among the Shakers four elders, two males and two females, have charge of each of the aggregated families.

ELDER (OE. *elder*, *eller*, AS. *ellen*, elder-tree). A tree or shrub of the genus Sambucus, which belongs to the order Caprifoliaceæ. There are about 20 widely distributed species. The common elder of Europe (*Sambucus nigra*) is a large shrub or sometimes a small tree, with large compound leaves and dense cymes of cream-colored flowers. The berries are black, occasional sports bearing white berries, which have a subacid, sweetish, and, to many, an unpleasant taste. They are extensively made into wine and used to adulterate port wine. The wood is yellow; that of old trees is hard, tough, takes a fine polish, and is used as a substitute for boxwood. The young wood has a very large pith. The scarlet-fruited elder (*Sambucus racemosa*) is a native of the colder portions of the Northern Hemisphere. It resembles the common species except in having greenish-white flowers and scarlet berries. This species is very ornamental and is frequently planted in shrubberies. The dwarf elder or danewort (*Sambucus ebulus*) is a peculiar species occasionally met with in Great Britain. In the United States the common elder (*Sambucus canadensis*) is a species greatly resembling the *Sambucus nigra* of Europe. The cymes of the flowers are flat-topped, and the berries, which are purplish black, are used for making wine and occasionally other preparations. This species is a very common shrub along roads and fences. The scarlet-fruited species occurs in rocky situations, and seems to fruit most abundantly at the north, or where the climate is cool. *Sambucus mexicana*, of the southwestern United States and Mexico, is a tree attaining a height of 25 feet or more, with a trunk 12 to 15 inches in diameter. It branches abundantly, and makes a dense shade. Medicinal properties have been attributed to the bark and the leaves, and hydrocyanic acid has been found in the leaves, young shoots, and green berries. The dried flowers are used in medicine. They contain a volatile oil, resin, wax, tannin, pectin, etc., and possess stimulant, carminative, and diaphoretic properties. The fresh fruits are used in the home manufacture of a wine, and elder-flower water is a common preparation used in confectionery. A perfume is made by distilling water, elder-flowers, and rectified spirits. The proportions used are ten pounds of elder-flowers, two gallons of water, and three ounces of spirits, from which mixture about one gallon is distilled. This distillate is used to flavor wines, jellies, etc. The young flower-buds are sometimes pickled like capers. Numerous household remedies are prepared from different parts of the plants. A number of other plants are known by the name elder, as wild elder (*Aralia hispida*), Marsh-elder (*Iva frutescens*), box-elder (*Negundo aceroides*), etc.

EL'DER, JOHN (1824-69). An English engineer and ship-builder. He was born in Glasgow, and was a son of David Elder (died 1866), who built the first marine engine in the establishment of Napier in 1822. He was educated in Glasgow, and after directing the drawing office in Napier's establishment became a member of the firm which after 1860 was conducted under the name of Randolph, Elder & Co. (1860). Elder is especially celebrated as the inventor of the compound or combined high and low pressure engines, in which the economy of fuel amounted to nearly forty per cent. More than 4000 men were employed in his factory.

ELDER, WILLIAM HENRY (1819-1904). An American prelate. He was born in Baltimore, was educated in that city and at the College of the Propaganda, Rome; was successively professor in and president of Mount Saint Mary's College, Emmitsburg, Md.; and was consecrated Roman Catholic Bishop of Natchez, Miss., in 1857. For some time he was coadjutor to Archbishop Purcell, of Cincinnati, and upon the death of the latter prelate in 1883 was elevated to the archiepiscopal see.

ELDER STATESMEN. A group of Japanese public men. See JAPAN, section on *History*.

ELDEST SON OF THE CHURCH (Fr., *Fils aîné de l'Eglise*). A title applied in former times to the King of France, to show his relation to the Church.

EL'DON, Lord (JOHN SCOTT) (1751-1838). Lord High Chancellor of England, and one of the greatest of English judges; born at Newcastle-on-Tyne, June 4, 1751. In 1766 he went to Oxford, where his brother was then a tutor, and entered University College. In 1770 he took his bachelor's degree, and in 1771 gained the Chancellor's Prize for an English essay. A clandestine marriage with a Miss Surtees, the daughter of a Newcastle banker, into which he entered in 1772, not only lost him his fellowship and cut off his clerical prospects, but threatened for a time to throw him into mercantile life. However, his brother's influence was strong enough to prevent this, and by his advice John returned to the university, where he supported himself by tutoring and in the meantime devoted himself assiduously to the study of law. His legal studies covered a narrow range, being confined almost entirely to Littleton, Coke, and the law reports, but must have been of the most intense and thorough character. In the year 1776, in which he was admitted to the bar, the death of his father placed him in possession of a small but sufficient fortune. In 1783, after only seven years at the bar, he won the distinction of becoming a King's counsel and a bencher of the Middle Temple. In the same year he became a member of Parliament, where he supported the administration of the younger Pitt. Though not a natural orator, and though he never became a good debater, his great energy and the force of his intellect and character made him a valuable and influential member of Parliament, and speedily gained for him political preferment. In June, 1788, he was made Solicitor-General and received the honor of knighthood.

In 1793 he was made Attorney-General, and in that capacity conducted the famous State trials of the following year. In 1799 he was appointed Chief Justice of the Court of Common Pleas, and was raised to the peerage with the title of Baron Eldon, of Eldon, and two years later he became Lord Chancellor of England, and, with the exception of the year of the Grenville and Fox administration (1806-07), held that high office until 1827. The great dignity of the chancellorship and its close relations to the Crown made it in Eldon's case as much a position of political as of legal authority and influence. The Chancellor of George III., of the Regency, and of George IV., who was at the same time the close friend and the most trusted adviser of the monarch, was practically the mainstay of the Crown and Government during that long period of Tory ascendency. His share in the administration of affairs was scarcely disguised by the composition of the successive ministries whose policy he shaped and in whose behalf he used without scruple the great powers of his high office. In 1821, perhaps as a reward for the part taken by him in the matter of the proposed divorce of the King, he was further honored with the dignity of Viscount Encombe and Earl of Eldon. On the advent of the Canning Ministry in 1827 he resigned the great seal and retired to private life. Though not a lawyer of wide and extensive learning, knowing nothing of the Roman jurisprudence or of the civil law of modern Europe, his complete mastery of the common-law system, and the subtlety and acuteness of his reasoning powers, made him a common-law judge of the highest, or all but the highest, order. It is here that his fame most securely rests. Though recognized also as one of the greatest of equity judges, the lack of precision and definiteness in the rules of equity jurisdiction, and the scope which it permitted to the administration of justice on conscientious grounds, proved an embarrassment to his logical mind. He was at his best when he had definite rules and binding precedents to follow and to evade by subtle distinctions. Though he, by these very qualities, contributed not a little to give definiteness and certainty to the equity system, he allowed the business of the Court of Chancery to fall so much in arrears as seriously to embarrass the administration of justice and to give the court the reputation for dilatoriness from which it still unjustly suffers. He survived his retirement from office for nearly eleven years, dying in London, January 13, 1838. For his biography, consult: Twiss, *The Public and Private Life of Lord Eldon* (Philadelphia, 1844); Surtees, *Sketch of the Lives of Lords Stowell and Eldon* (London, 1846); Lord Campbell, *Lives of the Lords Chancellors of England* (London, 1874-75).

ELDO'RA. A city and the county-seat of Hardin County, Iowa, 27 miles north by west of Marshalltown, on the Iowa Central and the North-Western Line railroads (Map: Iowa, D 2). The State Industrial School for boys is near by. The city is in an agricultural and stock-raising region. Deposits of fire and brick clay and building-stone are near. The manufactures include brick, lumber, flour, and foundry products. Population, 1900, 2233; 1905, 2278.

EL DORADO, *Sp. pron.* ĕl dō̂-rä′dō̂ (Sp., the gilded). A term applied, first to a South American king said to cover his body annually with gold-dust and bathe in a sacred lake, then to a fabled golden city, and finally to a fabled country abounding to an almost inconceivable degree in gold and precious stones. The legend, whose origin has never been satisfactorily accounted for, took many variant forms, while the mythical king and his equally mythical dominions were shifted with the utmost facility from one part of the continent to another. The story fired the imaginations of the gold-hungry Spaniards, who expended vast sums in sending out exploring parties, most of which returned decimated by privations, fatigue, and disease. The most celebrated expeditions were those of Diego de Ordaz (1531), whose lieutenant, Martinez, claimed to have visited a golden city, called Omoa, and to have been entertained by 'El Dorado' himself; and of Orellana (1540-41). In 1595 Sir Walter Raleigh took up the search and described the city as on an island in 'Parima' Lake (in Guiana), which for over two centuries was put down on the maps. Milton's lines will be recalled:

> "Guiana, whose great city Geryon's sons
> Call *El Dorado.*" —*Paradise Lost*, vi. 410, 411.

The name has since been applied to any place abounding in gold or in opportunities for acquiring sudden wealth, and, more specifically, to a county in California and a city in Colorado. In literature—and especially in poetry—frequent references have been made to the legend, the most celebrated of which is probably that in Voltaire's *Candide*, chs. xvii., xviii. Consult: Markham, *Search for El Dorado* (London, 1861); Van Heuvel, *El Dorado* (New York, 1844); Von Langegg, *El Dorado* (Leipzig, 1888); and Bandelier, *The Gilded Man* (New York, 1893).

EL DORADO, ĕl dō̂-rä′dō. A city and the county-seat of Butler County, Kan., 31 miles east by north of Wichita, on the Missouri Pacific, the Atchison, Topeka and Santa Fe, and the Kansas City, Mexico and Orient railroads, and on the Walnut River (Map: Kansas, F 4). It carries on a large trade in grain, live stock, and farm and dairy products, and has flour-mills, machine-shops, carriage-works, and limestone-quarries. El Dorado was settled in 1858 and incorporated in 1870. Pop., 1905, 3462.

ELD'S DEER. A rusine deer (*Cervus Eldi*) of the Malayan region and the island of Hainan. It is about four feet in height, and frequents open swampy regions, often gathering into large bands, and resembling the Indian swamp-deer in habits. It has a unique form of antler, the brow-tine curving down over the forehead in a long sweep, and the upper part consisting of many short points. Its native name in Burma is thamyn. Consult Lydekker, *Deer of All Lands* (London, 1898).

ELE′AN, ERE′TRIAN, or **ELEAN-ERETRIAN SCHOOL.** One of the Socratic schools. It was founded by Phædo (q.v.) at Elis, and transplanted by Menedemus to Eretria. We know less of this school than of any of its rivals, the Cyrenaic, the Cynic, and the Megaric schools (qq.v.), to the last named of which it approximated in its doctrines.

ELEANOR (ĕl′*e*-nẽr) **CROSSES.** The name given to twelve crosses said to mark the stages in the funeral journey of Eleanor, wife of Edward I. of England, from Hornby to London, where she was buried in Westminster Abbey. Of these crosses, not all of which are memorial crosses, those at Geddington, Northampton, and Waltham are preserved.

ELEANOR OF AQUITAINE, ăk′wĭ-tān′ (c.1122-1204). A Queen of France, and afterwards of England. She was the granddaughter of William IX., Duke of Aquitaine, and succeeded her father in 1137. She was married in the same year to Louis VII. of France. Her lively and somewhat frivolous disposition and her love for pleasure did not fit her for the society of a husband who was naturally austere, and who from religious conviction had adopted many ascetic habits. In the Holy Land, whither she accompanied him in 1147, her conduct was scandalous; finally a divorce was pronounced under the pretext of kinship in 1152. Eleanor soon gave her hand and possessions to Henry Plantagenet, who, in 1154, mounted the throne of England as Henry II. In 1170 Eleanor gave her son, Richard the Lion-Hearted, her personal dominions and aided him in his rebellion against Henry II. in 1173. Consequently she was placed in confinement, where she remained till the death of her husband, 1189. As soon as he died she regained her liberty, and reigned as regent until Richard's arrival from France. She also held this position during Richard's absence in the Holy Land, for which he left in 1190. After his escape in 1194 from his captivity, which befell him as he was returning home, she retired to the Abbey of Fontevrault, where she died, April 1, 1204.

E′LEAT′IC SCHOOL. The group of ancient Greek philosophers beginning with Xenophanes of Colophon, born about B.C. 570, and including Parmenides and Zeno, who both belonged to Elea, a Greek city of Lower Italy, and also Melissus of Samos. In opposition to the physical philosophy of the Ionic school and to the doctrine of Heraclitus (q.v.), who asserted that everything is flux, the Eleatic philosophers maintained that the only true reality is changeless being. All change and process and difference are empty illusions. The senses, as furnishing us with a changing content of consciousness, are of no value for knowledge. Thought is the organ of knowledge; indeed, thought and being are one. Consult the histories of philosophy by Zeller, Windelband, and Gomperz; also Burnet, *Early Greek Philosophy* (London, 1892). See PARMENIDES; XENOPHANES; ZENO.

EL′ECAMPANE′ (Fr. *enule-campane*, ML. *inula campana*, from Lat. *inula*, elecampane, *campus*, field). A genus of plants of the natural order Compositæ, nearly allied to Aster. The only important species is the common elecampane (*Inula helenium*), a native of damp meadows in the middle and south of Europe, rather rare in the British Isles. It is naturalized in America and has spread extensively. This plant, which is a coarse, stout perennial with large yellow flowers, was formerly much cultivated for its root, which was used in medicine, and still retains its place in the pharmacopœias, although comparatively neglected. The root has a faint aromatic odor and a bitter, acrid, and somewhat camphor-like taste. It acts as a gentle stimulant to the organs of secretion, promotes expectoration, and is diuretic and sudorific. It contains a peculiar principle called inulin, which is closely related to starch, but is deposited unchanged from its solution in boiling water on its cooling, and gives a yellowish instead of a blue color with iodine. The root also contains a peculiar principle called helenin or elecampane camphor, which resembles camphor in some of its properties. A number of species are cultivated for their abundant yellow or orange-colored flowers, which appear early in the summer. For illustration see Plate of EDELWEISS.

ELECTION (Lat. *electio*, choice, from *eligere*, to choose, from *e*, out + *legere*, to select). As a legal term, the choice, or the right or duty to choose, between two inconsistent alternative rights or benefits. These rights may be accorded by contract, as when a purchaser of property stipulates for the option of paying in money or in other property; or when an insurance company reserves the option of paying the sum for which a building is insured or of rebuilding it. Still more frequently persons are put to an election by a rule of law or of equity. A person whose property has been wrongfully taken may sue the wrongdoer for the value of the property in a contract action, or he may bring an action in tort for the conversion; but he is not entitled to pursue both remedies, and his choice of one cuts him off, at common law, from thereafter pursuing the other.

The doctrine of election in equity is said to have its origin in two inconsistent alternative gifts or benefits, one of which the giver has no power to make without, at least, the assent of the donor of the other gift. For example, A gives to B property belonging to C, and by the same instrument—generally a will—gives to C property belonging to A. Here C is put to an election between keeping his own property and rejecting A's gift, or accepting A's gift and turning over to B his (C's) property. This doctrine rests upon the intention of A as disclosed by the whole instrument. That intention clearly is that C shall not receive the gift named for him, unless he accedes to the gift named for B. Another example of election is that to which a widow is frequently put between her right of dower (q.v.) and an inconsistent benefit bestowed by her husband's will.

Election may be made by an express and formal announcement, or it may be, and more frequently is, implied from the conduct of the one entitled or bound to elect. In either case an election is not conclusive, as a rule, unless made with knowledge of all material facts necessary to an intelligent choice. When made with such knowledge it is irrevocable. Consult the authorities referred to under WILL, DOWER, etc.

ELECTION. In theological language, the divine act by which certain individuals are chosen to salvation in Christ. As expressed in the Articles of Religion of the Church of England, election is the doctrine of "God's everlasting purpose, whereby He hath constantly decreed by His secret counsel to deliver from curse and damnation those whom He hath chosen in Christ out of mankind, and to bring them by Christ to everlasting salvation as vessels made to honor." Besides this form of the doctrine, there is a lower and a higher form of it, which, apart from technical and polemical language, may be said to spring, the one from the supposed subordination of the divine act or purpose to the divine foreknowledge of human conduct; the other from the exaltation of the divine act or purpose into an absolute supremacy, having no relation whatever to human will or conduct. The former of these extremes corresponds to the Pelagian or Arminian doctrine of election, the latter to the hyper-Augustinian or Calvinistic. The Arminian aims to condition or limit the absolute character of the divine act in redemption in some way; the Calvinist aims to give to this act the most sovereign character. The one, while not altogether repudiating a doctrine of election, yet gives such prominence to the human conditions of the elective purpose as (in the view of the Calvinists) to destroy it altogether; the other maintains not only a doctrine of election or predestination, but also the correlative doctrine of reprobation. In the view of the Arminian, salvation is within the choice of the human will; in the view of the Calvinist, the human will is of little or no account—the decree of God is everything—and this decree (which Calvin admitted to be a *decretum horribile*) absolutely determines some to everlasting life and some to everlasting death. The separation has its source in the will of God and not in the moral conditions of mankind. Such extremes aside, the great question in respect to election is whether it depends upon the foreknowledge by God of faith on the part of the elect, or whether faith itself proceeds from grace and is thus conditioned upon election, which is therefore the ground of the foreknowledge of faith. This question is evidently the question of "prevenient grace" (see GRACE), for election is only the eternal purpose in respect to grace.

Although the expressions election, elect, etc., are frequent in Scripture, it cannot be said that what is known as the theological doctrine of election was acknowledged by the Christian Church till the time of Augustine. The Greek fathers confined their attention almost entirely to questions purely theological—that is to say, relating to the character and constitution of the Godhead. Gnosticism and Arianism, the two main forms of heretical opinion before Augustine, indicate the channels into which theological discussion had previously run. It was not till the Latin mind had taken up this discussion that the more practical question of the relation of the divine and human will in redemption came to receive special attention. The controversy between Pelagius and Augustine in the beginning of the fifth century brought out almost all the aspects of the question which have since, at successive epochs in the history of the Church, risen into renewed prominence. The contests between the Scotists and Thomists in the fourteenth century, between the Arminians and Calvinists, and, within the Roman Church, between the Jansenists and Molinists in the seventeenth century, are recurring expressions of the same radical conflict or divergency of opinion. See FOREKNOWLEDGE AND FOREORDINATION.

ELECTION, in politics, is the choice of public officers by the vote of those who are entitled to exercise the elective franchise. This is to be distinguished, on the one hand, from the appointment of officers by a superior, as by a king, a president, a governor, or a mayor; and, on the other hand, from their selection by lot. The last-named method of choosing public officers was considered by Aristotle one of the characteristic features of a popular government. It has been advocated by other writers, because of its tendency to prevent the formation of political parties. Party organization, the caucus, the coalition of different factions, the corruption of voters, the falsification of election returns, the interest of a particular candidate and kindred evils, it is argued, will all be swept away if officers are selected by lot.

When officers are chosen by the great body of the voting population, the election is spoken of as *popular* or *direct*. This is the prevailing form in free government at present. It had its origin in the general assemblies of primitive States, such as the Roman Concilia, the Athenian Ecclesia, the Teutonic Assembly of Freemen. After the establishment of the Roman Empire, popular election became a farce, and finally disappeared as a political institution of the Roman State. It was continued, however, in the ecclesiastical government of the Christian Church, and reappeared throughout Europe in the guilds of all kinds whose members chose their officers, as well as in the free towns, whose citizens elected their municipal officers to attend to local affairs, and their representatives to take part in the deliberations and legislation of Parliaments or the States-General. Election is said to be *indirect* or *representative* when it is limited to a comparatively small body, whose members have themselves been chosen by the general mass of electors. Elective monarchs have usually been selected in this way. Examples may be found in the case of the former kings of Poland and Hungary, and of the head of the old German Empire. At times the choice of candidates for kingship has been limited to a certain family, while the right of voting was exercisable by all the freemen. Such appears to have been the early practice of most Teutonic States. As a State enlarges, this practice is generally modified. Dr. Stubbs tells us that the election of the King in Anglo-Saxon England belonged, both in form and substance, to the Witan, although exercised by that body in the general assemblies of the whole nation. A striking example of indirect or representative elections in our time is afforded by the choice of United States Senators by the legislatures of the various States. In theory, the President of the United States is selected by the Presidential electors chosen in each State. In practice, however, these electors cast their votes for the party candidate.

Another classification of elections is based upon the governmental functions of the offices to which persons are chosen. An election is *national* which has for its object the selection of national officers, such as members of the United States House of Representatives, who are chosen every two years, and the President and Vice-President, who are chosen every four years. It is styled a *State* election when held for the choice of State officers, such as Governor, Lieutenant-Governor, and members of the State Legislature. If the political duties of an officer are confined to a particular subdivision of the State, such as a town, a city, or a county, his election is known as municipal.

Any fraudulent act tending to defeat an honest, free, fair, and pure election is a criminal offense at common law. Various statutes have been passed in almost every State for the express purpose of securing to voters entire freedom of action and of preventing improper practices in voting, in receiving votes, in counting votes, and in registering the results. The validity and regularity of elections are not infrequently disputed, and such disputes present important questions for the courts or for special tribunals. Of the latter class, the most famous in the history of this country is the Presidential Electoral Commission of 1877, constituted of five Senators, five members of the House of Representatives, and five associate justices of the United States Supreme Court, which decided the contest between Tilden and Hayes. By the Federal Constitution each House of Congress is the final judge of the election of its members, and a similar provision relating to the State legislatures is found in most of the State constitutions. It must be confessed that in cases of contested election in Congress or State legislatures purely partisan considerations have in great measure affected the decision. Contested Parliamentary elections in Great Britain are determined by the courts, and not by the House of Commons. Surely, this is the fairer and better method.

Election officers, whether inspectors at the various voting precincts, or members of a county or State board of canvassers, perform merely ministerial functions. They are not judicial or quasi-judicial officers. Their duty is to do the acts prescribed by statute, and not to pass judgment upon disputed questions. If they go beyond their ministerial duties and attempt to exercise judicial functions, they subject themselves to an action for damages by any person legally wronged, as well as to criminal punishment. (See BALLOT; ELECTORAL REFORM; SUFFRAGE; VOTE.) Consult: *People* vs. *Board of Canvassers*, 129 N. Y., 371-72; *People* vs. *Rice*, 129 N. Y., 465-66; Aristotle, *Politics*, by Weldon (London, 1883); Freeman, *Comparative Politics* (London, 1873); Woolsey, *Political Science* (New York, 1877); Stanwood, *Presidential Elections* (1892).

ELECTION CAKE. A rich loaf cake, which, in the days when Connecticut held an annual election, formed an important part of the refreshments offered to visitors to the State capital.

ELECTION COMMITTEE. See CONGRESS, UNITED STATES.

ELECTIVE AFFINITIES. A term expressing an old conception of the cause of chemical changes. According to that conception, if a given substance is brought into contact with two other substances, with either of which it is capable of combining, it will enter into combination with the one for which it has the greater affinity. Elective affinities were thus supposed to be invariable, and to be determined entirely by the nature of substances. At present this idea is known to be false, or rather to require very important limitation. The nature of substances, while one of the factors determining the course of chemical change is not the only factor, the active masses of substances and the temperature being known to have a definite influence in all cases. See BERGMAN; BERTHOLLET; AFFINITY, CHEMICAL; REACTION; ELECTRO-CHEMISTRY; THERMO-CHEMISTRY.

ELECTIVE COURSES and **ELECTIVE STUDIES.** Terms that have come into common use during the last thirty or forty years in American colleges, and to some extent in other educational establishments, to indicate the studies which may be elected or chosen by undergraduate students. In earlier days there was a required curriculum which must be followed by all candidates for the degree of bachelor of arts. At a later period, to meet the special needs or wishes of individuals, certain studies were made 'optional'—modern languages, for example, the higher branches of mathematics, botany, surveying, and other scientific or technical branches. The rapid growth of science and the enlarged resources of the colleges were naturally followed by enlargement of the teaching forces, and by provision for instruction in subjects before neglected. Choice became imperative. To a considerable extent this necessity was recognized and satisfied by the foundation of technical or scientific schools, sometimes departments of or annexes to the old colleges, sometimes independent establishments. Gradually the old curriculum, often called the regular college course, yielded to the same influences. A few institutions still adhere, with commendable pride, to the theory of a liberal education based upon the classics and mathematics—antecedent to the time-honored baccalaureate degree. Yet the American colleges generally offer in these days a very considerable freedom in the selection of subjects to which the student may devote his time. There are certain inherent dangers in this freedom. The love of ease may lead to the selection of courses—which are called 'soft' in college parlance—exacting but little mental effort; or the ignorance and inexperience of youth may lead to selections which will be regretted in mature life. To obviate such dangers, it is common to lay before the students 'groups' of subjects which form a good combination. With more or less emphasis these 'groups' are commended to students. As a further guide to the wise selection of subjects, members of a faculty are always ready to give advice, and in some places those teachers who are most interested in pedagogics are officially recognized as 'advisers'—a term which seems to have been introduced to supersede that of tutors, who were regarded rather as disciplinarians than as counselors. On the whole, the establishment of elective courses marks a propitious advance in higher education. The system works well wherever due care is exercised by the authorities to secure industry, application, and concentration. The University of Virginia was a pioneer in the provision of electives. Most of the State universities are now thoroughly committed to the principle. The older colleges, led by Harvard, have adopted it to a greater or less extent. The new foundations—Cornell, Johns Hopkins, Chicago, and Leland Stanford, Junior—have never felt the fetters of a traditional curriculum.

The exact position of any college can be ascertained only by reference to its latest announcements, for changes frequently occur in the subjects offered and in the technical requirements for degrees. Consult: Butler, *Education in the United States* (Albany, 1900); Eliot, *Educational Reform* (New York, 1898); *The Educational Review* (New York, 1891, et seq.). See COLLEGES, AMERICAN; UNIVERSITY; and the various institutions.

ELECTORAL COLLEGE. In the political system of the United States, the body of electors in each State who have been chosen to select the President and Vice-President. The expression does not appear in the Constitution or statutes, but is a popular designation of the electors, adopted by analogy to the college of cardinals, to which the choice of the popes is committed. It is sometimes employed of the whole body of electors for President and Vice-President, chosen by all the States. The Constitution prescribes (Art. II.; and Amendments, Art. XII.) the number of electors and the manner in which they shall exercise their high functions, but leaves to the States the mode of appointing them, and to Congress the power to determine a uniform time for choosing them and the day on which they shall give their votes. Accordingly, the members of the electoral college in each and every State are chosen simultaneously by popular vote on the Tuesday next after the first Monday in November. Their number is equal to the whole number of Representatives which the State sends to both branches of Congress. They are required to meet at some place designated by the Legislature of their State on the second Monday in January, and then and there to vote by ballot for President and Vice-President, of whom one, at least, shall not be a resident of the same State with themselves. Each electoral college then makes a list of the names of all its candidates for President and Vice-President, with the number of votes for each; the list is signed and certified by every member of the college, is authenticated by the Governor of the State, and transmitted to the President of the Senate of the United States. On the second Wednesday in February the electoral votes are opened and counted in presence of both Houses of Congress, assembled in the chamber of Representatives, and the result is announced by the president of the Senate. The persons who receive the highest number of votes, respectively, for the offices of President and Vice-President are declared elected, provided they have received a majority of all the votes. In case of a tie, the House of Representatives, voting by States, each State having one vote, is to choose between the equal candidates for President, a majority of all the States being necessary to a choice. The Senate has the power to choose in case of a tie in the vote for Vice-President. In the same way, in case there is no tie, but the leading candidates fail to receive a majority of all the votes, the election for President is thrown into the House, and that for Vice-President into the Senate. Under the Constitution as originally framed the electoral colleges did not designate their choice for President or Vice-President, but when the total votes were counted by the President of the Senate, the candidate receiving the highest number of votes was declared to be elected President, and his nearest competitor Vice-President. But the Twelfth Amendment to the Constitution, adopted in 1804, changed the mode of voting for the two officers, the electors being required to vote separately for President and Vice-President.

The present position and functions of the electoral college furnish a striking illustration of the way in which a written and stable constitution may be undermined and amended by the silent process of customary observance. It is obvious that the Constitution contemplates that the electoral college in each State shall be a deliberative body of men, freely exercising an untrammeled choice for the high offices which they are to fill. They are not called upon, nor are they expected, to vote as a unit, still less to meet for the sole purpose of registering a result which has already been reached elsewhere and by others. That this remarkable change in the conception of the constitutional functions of the electoral college has been brought about is due to the course of our political development, and particularly to the national convention system of nominating candidates for the Presidency and Vice-Presidency. These conventions are not recognized by the Constitution, nor have their nominations any legally binding force. But the electors, subsequently nominated and elected for the sole purpose of giving the vote of the State to a certain party candidate, are as securely bound to that course of action by custom and honor as they would be by statute. The people, consequently, elect the President and Vice-President by States, and the college is a cumbrous machine for formally conveying to Washington the wishes of the majority. Since 1801 the vote of an elector has been known with certainty several weeks before it is cast, and several months before it is officially announced. The electoral system has constantly endangered the State, on account of the absence, until recently, of any general law to govern the president of the Senate in his canvass of the votes, and the tendency of Congress to decide every case of doubt or disputed returns arbitrarily as it arose. Nothing was accomplished, however, until 1887, when a law was passed (approved February 3) to cover the contingency of rival electoral colleges and disputed returns. Under the terms of this act, each State is conceded to have the right of determining all controversies or contests regarding the appointment of its own Presidential electors; and in case of any such contest, Congress is to accept the State's settlement of the same as conclusive, and it cannot reject any electoral vote, duly certified, unless both Houses concurrently decide that that vote has been irregularly given. If more than one return from a State is received, only those votes are to be counted which the State itself has indorsed as regular; but if the State has been unable to settle the question, owing to its having two or more rival sets of authorities, or from any other cause, then the two Houses are to decide the dispute. See CONSTITUTION OF THE UNITED STATES; CONVENTION; PRESIDENT; and the authorities there referred to.

ELECTORAL COMMISSION. In United States history, the body of men provided for by an act of Congress, approved January 29, 1877, to settle certain disputed questions in regard to the electoral votes of several States in the Presidential election of 1876. As the counting of the electoral votes in the presence of the two Houses of Congress proceeded according to custom, it had been found that there were conflicting certificates from four different States—Florida, Louisiana, Oregon, and South Carolina; and the two Houses were unable to agree in any case which certificate should be received as genuine. The Senate at the time was controlled by the Republican Party, the House of Representatives by the Democratic Party, and there was thought to be danger of civil disturbances on account of certain questions likely to arise in the counting of the electoral votes. Under these circumstances, a majority of each of the two political parties in Congress agreed to create a commission to be composed of five Senators chosen by the Senate; five members of the House of Representatives, chosen by that body; and five associate justices of the Supreme Court, four of whom were designated by the act of Congress, and the fifth of whom was to be selected by the four—to which commission should be referred, for judgment and decision, the question which of two or more conflicting certificates received from any State of the votes cast by the electoral college of such State for President and Vice-President in the election of 1876 was the certificate provided for in the Constitution of the United States. The judgment of the commission in any matters referred to it, unless set aside by the concurrent action of the Houses of Congress, was to be final. The proposed law was thereupon enacted, and the Senate appointed three Republicans and two Democrats, and the House of Representatives three Democrats and two Republicans as members of the commission. Of the four associate justices of the Supreme Court who were named in the law, two were understood to be Democrats and two Republicans; and these selected as the fifth associate justice to serve with them upon the commission, Mr. Justice Bradley, a Republican. The commission was constituted as follows: Justices Clifford, Strong, Miller, Field, and Bradley; Senators Edmunds, Morton, Frelinghuysen, Thurman, and Bayard; and Representatives Payne, Hunton, Abbott, Garfield, and Hoar. Upon the illness of Senator Thurman, his place was filled by the choice of Senator Kernan. The certificates and accompanying papers were successively referred to the commission, which proceeded to hear argument upon the questions involved. A notable group of distinguished lawyers participated in the conduct of the case, William M. Evarts, Stanley Matthews, E. W. Stoughton, and Samuel Shellabarger representing the Republicans, and Judge J. S. Black, Matthew H. Carpenter, Charles O'Conor, J. A. Campbell, Lyman Trumbull, Ashbel Green, Montgomery Blair, George Hoadley, William C. Whitney, R. T. Merrick, and A. P. Morse representing the Democrats. The result in the case of each State was a decision of the commission, by a vote of 8 to 7—the vote following the line of party division in the body—that the certificate of the electoral votes cast for Hayes and Wheeler, the Republican candidates for President and Vice-President, was the certificate which contained the lawful electoral vote of said State, and that the other certificates were illegal and void. The Republican Senate concurred in this judgment in each case, while the Democratic House of Representatives dissented. The decision of the commission, therefore, according to the terms of the statute, became irrevocable; the electoral votes were counted accordingly; and Rutherford B. Hayes and William A. Wheeler were found duly elected, by a majority of one electoral vote, respectively President and Vice-President for a term of four years, from March 4, 1877. The controlling question before the commission was whether—an electoral certificate being in form according to law, as those in favor of the Republican candidates were—it was competent for Congress or the commission to go behind the same and take evidence modifying or explanatory (*aliunde*) in support of alleged irregularities and frauds committed before such certificate was issued. Upon this question the Democrats in Congress and in the commission took the affirmative, while the Republicans took the negative. The full proceedings of the commission were published as part iv., vol. v. of the *Congressional Record* of 1877.

ELECTORAL REFORM. In general, any improvement by law or custom in the manner of conducting elections to public office. Specifically, the phrase describes the movement of the last hundred years for the purification of elections in Great Britain and the United States.

It is of the utmost importance, in a State whose government rests wholly or in great part on popular suffrage, that public elections should be free and honest. When they are of this character, public officials are true representatives of the people, and the legislation and policies which such officials adopt fairly reflect the popular will. The tendency, however, in every representative government is toward the control of nominating conventions and of elections by small bodies of men whose energies are chiefly directed to the manipulation of caucuses and party machinery. While the great mass of electors are engrossed in the conduct of their private affairs, these professional politicians, taking advantage of the popular apathy, dictate nominations to office, force party conventions to register their secret choices, and control the entire machinery of elections.

Accordingly, agitation for electoral reforms has usually been directed toward one of three ends: (1) A change in the qualifications of electors; (2) securing to electors the free and effective expression of their choice of officers; (3) the punishment of those guilty of corrupt practices in connection with elections.

(1) QUALIFICATIONS OF ELECTORS. Both in Great Britain and in the United States the State has treated the elective franchise as a privilege of its citizens, and not as one of their natural rights. Hence it has bestowed that privilege from time to time upon those, and those only, who it has been considered would use it wisely and for the best interests of the State. Public opinion concerning the proper qualifications of voters has undergone many changes during the last hundred years. In the main, these have been in the direction of extending the franchise to new classes of voters, of broadening the basis of the electorate. When the United States became independent, suffrage was limited in every one of the commonwealths to property-owners. In Massachusetts it was required not only that the voter be of age, but that he be the owner of real estate worth £60 sterling, or of a freehold yielding £3 annual income. In New York it was necessary that he be seized of a freehold worth £20, or pay a rent of 40 shillings a year, and have his name on the list of taxpayers. South Carolina insisted upon the voter being a white freeman and freeholder, and believing in the existence of a God and in a future state of rewards and punishment.

During the last century, however, most of the States accepted the theory of universal manhood suffrage, and extended the elective franchise to all male citizens of twenty-one years and upward, while a few of the States have granted to women also the privilege of voting. Although the tide of electoral reform in this country has set mainly in the direction of universal suffrage, in some States its purpose has been to impose restrictions upon the elective franchise. California, for example, has enacted that no person who is unable to read the State Constitution in the English language and write his name shall ever exercise the privilege of a State elector. Connecticut and Massachusetts impose somewhat similar restrictions upon voters. Several of the Southern States have recently limited the suffrage by imposing educational qualifications upon voters, or by requiring them to pay certain taxes. This policy has for its prime object the disqualification of ignorant and indigent negroes. In Louisiana and some other States persons are permitted to vote who do not possess the prescribed qualifications, provided they were entitled to vote on January 1, 1867, or are sons or grandsons of persons thus entitled. The class thus excepted includes poor and illiterate whites.

In Great Britain the trend of electoral reform has followed the same general course as in the United States, although it has not yet reached the goal of universal manhood suffrage. The electorate has been extended several times, until it includes not only copyholders, leaseholders, and householders of premises of small values, but also men occupying lodgings of the yearly value of £10. Agitation is still in progress for extending the elective franchise to all men of proper age and sound mind, without regard to the ownership or occupation of property, and also for enabling women to vote. See WOMAN SUFFRAGE.

(2) PROTECTION OF VOTERS. It is of prime importance that perfect freedom of choice should be secured to electors. Hence the secret ballot has been substituted for the viva voce vote (see BALLOT), and bribery and intimidation of electors are treated as grave criminal offenses. Not only should the elector be allowed to exercise his free choice at the polls, but that freedom ought not to be rendered ineffective by the improper manipulation of caucuses or primaries, or by giving to the voters of some districts undue advantage over others. The caucus or primary is a meeting of the members of a particular political party or group for the purpose of nominating candidates for office within a prescribed district, or of electing delegates to larger conventions of the party, or of declaring party principles. These gatherings have often been controlled by unscrupulous persons, who have not hesitated to resort to fraud and violence. In order that the party caucus or primary should reflect the views of the majority of the party electors of the district, statutes have been enacted in several States surrounding these voluntary gatherings with many of the legal safeguards which protect general elections. The place and time for the caucus or primary is fixed by law; the manner of registration and voting is prescribed, and severe criminal penalties are affixed to fraudulent or violent manipulations of these meetings.

While this legal regulation of the primary has done much to mitigate its evils, it is still open to the objection that it leaves the control of the nominating system in the hands of the party managers, and practically excludes the independent voter from exercising any considerable influence in the selection of candidates for public office. The recent increase in the number of independent voters has given them new weight in politics, and they are now demanding a further reform, which has in contemplation the substitution of 'direct' for primary and caucus nominations. This is to be effected by permitting a specified number of registered voters to place a candidate in nomination directly, by a written declaration signed by them, and without the intervention of the machinery of caucuses and conventions now employed. All candidates for a given office being nominated in the same simple and direct way, it is assumed that they will represent the unconstrained choice of the electorate, and that all will occupy an equal footing as candidates. The method of 'direct nominations,' as it is called, has recently been adopted in several of the Western States, and is apparently meeting with favor in other parts of the country. The experiment is too new, however, to furnish any satisfactory evidence of its real value.

A flagrant example of the control of elections by corrupt party managers was formerly afforded by the pocket and rotten boroughs of England, which were disfranchised by the Reform Bill of 1832. These were boroughs (having the right to elect members of Parliament) that were controlled by non-resident noblemen, either by reason of their landed proprietorship or of their purchase of the electors. In many of them the number of voters was very small. For example, the borough of Gatton had but seven electors, and that of Old Sarum but one—the keeper of an alehouse. When Lord Russell introduced his Reform Bill in 1831, 90 members of Parliament were returned by 46 boroughs with less than 50 votes each, and a majority of the House of Commons was elected by 15,000 out of 3,000,000 male adults. One peer controlled boroughs which sent up 11 members of his choice to the House of Commons, while some of the great manufacturing centres had no representation in Parliament. The Reform Bill disfranchised 56 of these rotten boroughs, and made a new distribution of Parliamentary representatives throughout the kingdom.

A condition of things somewhat similar to that in Britain when Lord Russell introduced his Reform Bill exists in some of our States, notably Connecticut, where the unit of legislative representation is the township. A century and a half ago such a basis of representation was a fair one. Now it is not. Many of the towns have now a smaller population than a hundred years ago, while others have increased their voters a thousandfold. As a result, a handful of electors in a rural township may have an equal voice in the State Legislature with a thousand electors in a large village or a city.

The Fifteenth Amendment to the Federal Constitution provides that "the right of the citizens of the United States to vote shall not be denied or abridged by the United States or by any State on acount of race, color, or previous condition of servitude," and vests Congress with power to enforce this provision by appropriate legislation. The Fourteenth Amendment prescribed as the penalty for the abridgment of the right to vote by a State, reduction in the representation in Congress of that State. Although several States have in effect deprived negro citizens of the right to vote, Congress has enacted no legislation to enforce this constitutional provision.

(3) CORRUPT ELECTORAL PRACTICES. The most heinous of these are false personation and repeating by voters, and bribery and intimidation by candidates for office or their partisans. Both in Britain and in this country repeated efforts have been made by legislators to eradicate these practices, but without entire success. Perhaps the most comprehensive and rigorous piece of legislation of this sort is the British Corrupt Practices Act of 1883, with its amendments. Its principal features are: (1) The severe penalties inflicted upon those guilty of false personation at the polls or of voting more than once at the same election, as well as upon all who indulge in the intimidation, undue influence, or bribery of voters; (2) the restriction within very narrow limits of the employment of paid agents, clerks, messengers, and others by candidates or election committees; (3) the prescribing of a fixed scale of lawful expenditures by candidates and committees; (4) requiring a full and correct account of such expenditures. Several of our States have laws of a similar character. Although none of them are as sweeping or as effective as the British act, their results have been beneficial.

A lucid account of the provisions and working of the British statute, by its draftsman, Sir Henry James, will be found in *The Forum* for April, 1893 (vol. xv., p. 129). The article is followed by accounts of similar statutes in several of our States. Lord Bradbourne criticises the British act in a series of very entertaining articles on "Old Elections in England" (*Blackwood's Magazine*, cli. 763, and id., clii. 38, 248, 688).

Some of the grosser forms of fraud at elections, such as the use of fraudulent and tissue ballots and the stuffing of ballot-boxes, have been rendered obsolete by the adoption of the Australian ballot, and the assumption by the State of the duty of furnishing an official ballot in place of the party ballot formerly provided by the several party organizations. The practice of repeating, dishonest counts, and false returns of votes have been checked by the registration of voters, the provision of an increased number of official watchers at the polls, and, in some parts of the country, by the employment of voting and counting machines. See BALLOT; CORRUPT PRACTICES; ELECTION; VOTING-MACHINE. Consult: Bishop, *Colonial Elections* (New York, 1893); Dallinger, *Nominations for Elective Office* (New York, 1897); Stürcks, *Primary Election Legislation* (New York, 1898); Ward, *Treatise on the Law Relating to Parliamentary and Municipal Elections* (2d ed., London, 1886).

ELECTORAL VOTES. The votes cast by Presidential electors in the United States for the Presidential and Vice-Presidential candidates. The candidates for the two offices were not voted for separately until after 1805, before which time the candidate receiving the largest total number of votes at any given election was declared President, and the one receiving the next largest number the Vice-President. The electoral votes cast in the various campaigns since 1789 have been as follows: In 1789: George Washington, 69; John Adams, 34; Samuel Huntington, 2; John Jay, 9; John Hancock, 4; Robert H. Harrison, 6; George Clinton, 3; John Rutledge, 6; John Milton, 2; James Armstrong, Edward Telfair, and Benjamin Lincoln, each, 1. In 1793: George Washington, 132; John Adams, 77; George Clinton, 50; Thomas Jefferson, 4; Aaron Burr, 1. In 1797: John Adams, 71; Thomas Jefferson, 68; Thomas Pinckney, 59; Aaron Burr, 30; Samuel Adams, 15; Oliver Ellsworth, 11; George Clinton, 7; John Jay, 5; James Iredell, 3; Samuel Johnston, George Washington, and John Henry, each, 2; Charles C. Pinckney, 1. In 1801: Thomas Jefferson and Aaron Burr, each 73; John Adams, 65; C. C. Pinckney, 64; John Jay, 1. In 1805: for *President*, Thomas Jefferson, 162; C. C. Pinckney, 14; for *Vice-President*, George Clinton, 162; Rufus King, 14. In 1809: for *President*, James Madison, 122; C. C. Pinckney, 47; George Clinton, 6; for *Vice-President*, George Clinton, 113; Rufus King, 47; John Langdon, 9; James Monroe, 3; and James Madison, 3. In 1813: for *President*, James Madison, 128; De Witt Clinton, 89; for *Vice-President*, Elbridge Gerry, 131; Jared Ingersoll, 86. In 1817: for *President*, James Monroe, 183; Rufus King, 34; for *Vice-President*, Daniel D. Tompkins, 183; John E. Howard, 22; James Ross, 5; John Marshall, 4; Robert G. Harper, 3. In 1821: for *President*, James Monroe, 231; John Q. Adams, 1; for *Vice-President*, Daniel D. Tompkins, 218; Richard Stockton, 8; Daniel Rodney, 4; Robert G. Harper, Richard Rush, each, 1. In 1825: for *President*, John Q. Adams, 84; William H. Crawford, 41; Andrew Jackson, 99; Henry Clay, 37; for *Vice-President*, John C. Calhoun, 182; Nathan Sanford, 30; Nathaniel Macon, 24; Andrew Jackson, 13; Martin Van Buren, 9; Henry Clay, 2. In 1829: for *President*, Andrew Jackson, 178; John Quincy Adams, 83; for *Vice-President*, John C. Calhoun, 171; Richard Rush, 83; William Smith, 7. In 1833: for *President*, Andrew Jackson, 219; Henry Clay, 49; John Floyd, 11; William Wirt, 7; for *Vice-President*, Martin Van Buren, 189; John Sergeant, 49; William Wilkins, 30; Henry Lee, 11; Amos Ellmaker, 7. In 1837: for *President*, Martin Van Buren, 170; William H. Harrison, 73; Hugh L. White, 26; Daniel Webster, 14; Willie P. Mangum, 11; for *Vice-President*, Richard M. Johnson, 147; Francis Granger, 77; John Tyler, 47; William Smith, 23. In 1841: for *President*, William H. Harrison, 234; Martin Van Buren, 60; for *Vice-President*, John Tyler, 234; Richard M. Johnson, 48; Lyttleton W. Tazewell, 11; James K. Polk, 1. In 1845: for *President*, James K. Polk, 170; Henry Clay, 105; for *Vice-President*, George M. Dallas, 170; Theodore Frelinghuysen, 105. In 1849: for *President*, Zachary Taylor, 163; Lewis Cass, 127; for *Vice-President*, Millard Fillmore, 163; William O. Butler, 127. In 1853: for *President*, Franklin Pierce, 254; Winfield Scott, 42; for *Vice-President*, William R. King, 254; William A. Graham, 42. In 1857: for *President*, James Buchanan, 174; John C. Frémont, 114; Millard Fillmore, 8; for *Vice-President*, John C. Breckenridge, 174; William L. Dayton, 114; A. J. Donelson, 8. In 1861: for *President*, Abraham Lincoln, 180; John C. Breckenridge, 72; Stephen A. Douglas, 12; John Bell, 39; for *Vice-President*, Hannibal Hamlin, 180; Joseph Lane, 72; Herschel V. Johnson, 12; Edward Everett, 39. In 1865: for *President*, Abraham Lincoln, 212; George B. McClellan, 21; for *Vice-President*, Andrew Johnson, 212; George H. Pendleton, 21. In 1869: for *President*, Ulysses S. Grant, 214; Horatio Seymour, 80; for *Vice-President*, Schuyler Colfax, 214; Frank P. Blair, Jr., 80. In 1873: for *President*, Ulysses S. Grant, 286; Thomas A. Hendricks, 42; B. Gratz Brown, 18 (Horace Greeley having died in November, 1872); Charles J. Jenkins, 2; David Davis, 1; for *Vice-President*, Henry Wilson, 286; B. Gratz Brown, 47; G. W. Julian, A. H. Colquitt, each, 5; J. M. Palmer, T. E. Bramlette, each, 3; W. S. Groesbeck, W. B. Machen, N. P. Banks, each, 1. In 1877: for *President*, Rutherford B Hayes, 185; Samuel J. Tilden, 184; for *Vice-President*, William A. Wheeler, 185; Thomas A. Hendricks, 184. In 1881: for *President*, James A. Garfield, 214; Winfield S. Hancock, 155; for *Vice-President*, Chester A. Arthur, 214; William H. English, 155. In 1885: for *President*, Grover Cleveland, 219; James G. Blaine, 182; for *Vice-President*, Thomas A. Hendricks, 219; John A. Logan, 182. In 1889: for *President*, Benjamin Harrison, 233; Grover Cleveland, 168; for *Vice-President*, Levi P. Morton, 233; Allen G. Thurman, 168. In 1893: for *President*, Grover Cleveland, 277; Benjamin Harrison, 145; J. B. Weaver, 22; for *Vice-President*, A. E. Stevenson, 277; W. Reid, 145; J. G. Field, 22. In 1897: for *President*, William McKinley, 271; William J. Bryan, 176; for *Vice-President*, Garret A. Hobart, 271; Arthur Sewall, 149; Thomas E. Watson, 27. In 1901: for *President*, William McKinley, 292; William J. Bryan, 155; for *Vice-President*, Theodore Roosevelt, 292; A. E. Stevenson, 155. In 1904; for *President*, Theodore Roosevelt, 336; Alton B. Parker, 140; for *Vice-President*, C. W. Fairbanks, 336; H. G. Davis, 140. Consult McClure, *Our Presidents* (New York, 1905).

ELECTORS, GERMAN IMPERIAL (Lat., from *eligere*, to choose). In the Holy Roman Empire, the college of lay and ecclesiastical princes in whom the right of choosing the King of the Romans was vested. With the extinction of the Carolingian line after the breaking up of the Empire of Charles the Great, the kingship in Germany became elective, the right of election residing in certain of the great feudatories, though just in whom or on what grounds is not clear from the early mediæval accounts. An electoral body is vaguely mentioned in chronicles of 1152, 1198, and 1230. The electoral college was first clearly defined in 1356 in the Golden Bull, a constitution for the Holy Roman Empire, issued by the Emperor Charles IV. This document also prescribed the exact form and manner of election of the "King of the Romans and future Emperor." Its statements seem to indicate that the right of election had been attached to certain hereditary offices in the Imperial Court, as each prince elector is associated with such an office. The electors were the Archbishop of Mainz (Mayence), Arch-Chancellor of the Holy Empire for Germany; the Archbishop of Cologne, Arch-Chancellor for Italy; the Archbishop of Treves (Triers), Arch-Chancellor for the Gallic Provinces and Arles; the King of Bohemia, Arch-Cupbearer; the Count Palatine of the Rhine, Arch-Steward; the Duke of Saxony, Arch-Marshall; and the Margrave of Bradenburg, Arch-Chamberlain. The German Princes held that an election as King of the Romans by the German electors was also an election as Holy Roman Emperor; but the popes contended that they alone, as vicars of God, could bestow the imperial dignity. The Peace of Westphalia (1648) created an eighth electorate for the heirs of the Count Palatine, Frederick V., who had been despoiled of his electorate in behalf of the Duke of Bavaria in the Thirty Years' War. A ninth, that of Brunswick-Lüneburg, was created in 1692, and fully established in 1710, as the electorate of Hanover. In 1777 the inheritance of Bavaria by the Elector Palatine restored the number to eight. In 1803, just before the dissolution of the Holy Roman Empire, the number was increased. From the Fifteenth Century the electors constituted a separate college in the Imperial Diet. Consult: Bryce, *The Holy Roman Empire* (London, 1892). The Golden Bull is translated in Henderson, *Select Historical Documents of the Middle Ages* (London, 1892). See HOLY ROMAN EMPIRE.

ELEC′TRA (Lat., from Gk. Ἠλέκτρα). In Greek legend: (1) The daughter of Agamemnon and Clytemnestra, and the sister of Orestes and Iphigenia. While Agamemnon was absent at the siege of Troy, his cousin Ægisthus corrupted Clytemnestra, and, on the great leader's return, shamefully assisted her in murdering him. Electra, alarmed for the safety of Orestes, and desiring to have in him an avenger, contrived to send him to his uncle Strophius, King of Phocis. There he met Pylades, and formed with him the friendship so famed in story. By Pylades she was mother of Strophius and Medon. Her experiences are recounted by Æschylus in the *Choëphoroi*, by Sophocles in *Electra*, by Euripides in the three dramas *Electra*, *Orestes*, and *Iphigenia Among the Tauri*, by Racine in *Electra*, and by Goethe in *Iphigenie auf Tauris*. (2) Wife of Atlas, by Zeus, mother of Dardanus, and one of the Oceanides. (3) One of the Pleiades, daughter of Atlas and Pleione.

ELECTRICAL ENGINEERS, AMERICAN INSTITUTE OF. This is a national engineering society, with headquarters in New York, organized in 1884. Its objects are to advance the theory and practice of electrical engineering and the arts and sciences connected with the utilization of electricity. The membership includes consulting electrical engineers, professors of electrical engineering, chief engineers, managers, superintendents, and other officers of electrical railway, lighting, telephone, and manufacturing companies, and other persons interested in electrical engineering. The institute is governed by a board of directors consisting of the two junior past-presidents, a president, six vice-presidents, twelve managers, a treasurer, and a secretary. The total membership May 1, 1906, was 3870 classified thus: honorary, 2; members, 508; associates, 3360. Meetings are held monthly in New York, and at various times in thirty principal cities and institutions of learning in the United States and Canada, where branches have been organized. The Institute publishes the *Proceedings* (monthly) and the *Transactions* (annually).

ELECTRICAL MACHINE (from *electric*, from Lat. *electrum*, Gk. ἤλεκτρον, *ēlektron*, amber; connected with ἠλέκτωρ, ēlektōr, bright sun, Skt. *arka*, sun, from *arc*, to shine). An instrument which generates electricity by friction or by the inductive action of one set of conductors on another. It is believed that the earliest known form was that of Otto von Guericke, which is described and illustrated in his work *Experimenta Nova* (Amsterdam, 1672), a drawing from which is reproduced in Fig. 1. It consisted of a ball of sulphur mounted on an axle which could be revolved. The dry hand of the experimenter was placed in contact with the sulphur sphere, which was electrified by the friction thus developed. In Gravesande's *Physices Elementa* (1720) is described an electrical machine where the ball of sulphur is replaced by a hollow glass sphere which is rotated by means of cords or belts connected with a wheel and crank. In this apparatus threads are provided which are attracted to the charged sphere to show its electrification. In 1744 the electrical machine was improved by Bose of Wittenberg, who introduced a metallic conductor, by means of which the electricity could be conducted from the sphere to the earth and produce a spark on its way. In the same year Winkler of Leipzig devised a machine with a cylinder of glass instead of a sphere, and substituted for the hand two pieces of wool or leather to rub against the glass. Subsequent developments in the eighteenth century included devices to rotate the cylinder, collecting combs or conductors with points, the use of amalgam on the rubbing surfaces, and, finally, the substitution of a disk of glass for the cylinder and sphere previously employed.

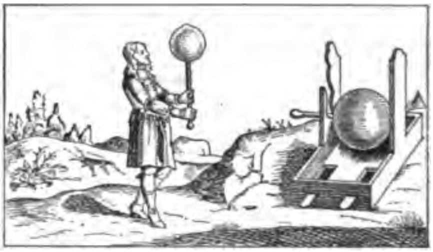


FIG. 1. VON GUERICKE'S ELECTRICAL MACHINE.

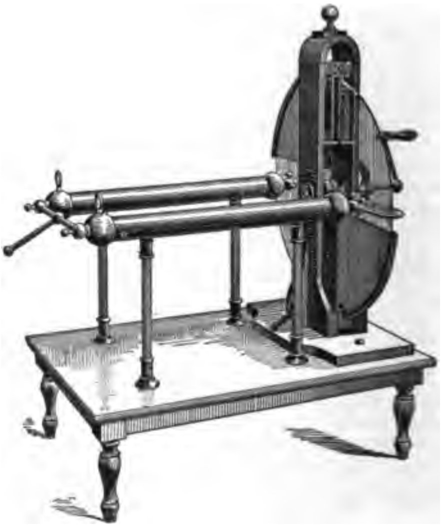


FIG 2. SIMPLE FRICTIONAL MACHINE.

In its usual form the frictional machine, as these early pieces of apparatus were termed, is shown in Fig. 2. The glass disk is electrified by the friction of the rubber and the silk flaps, and a positive charge on the glass is produced, which escapes at the rings or points to the prime conductor, where it can be used to charge a Leyden jar or perform other experiments, while the negative charge produced on the rubber passes to the ground. Nearly all forms of frictional machines have been rendered obsolete and their place taken by influence machines, whose action is far more effective, and is less dependent on the dryness of the atmosphere. Of the influence machines which are extensively used, those of Töpler, Wimshurst, and Holtz, with improvements added by other physicists, are the leading types. Their action is based on the principle of the electrophorus (q.v.), where a charged body is used to charge a conductor which is under its influence. If a conducting body is brought near a substance which is electrified and then is touched so that a path of escape is provided for electricity of the same nature as the original charged body, a charge is communicated to the conductor. The influence machine accomplishes this automatically instead of requiring contact to be made with the finger, as in the case of the electrophorus. In the Töpler machine there are two glass plates, one of which is capable of revolution and is provided with a number of pieces of tinfoil attached to its surface, with small buttons of metal in the centre of each, while the other disk is fixed and has cemented to it two pieces of tinfoil, which are termed field-plates. A slight charge is given to one of these field-plates and the movable disk is then revolved so that when one of its tinfoil disks, or carriers, comes opposite the field-plate, it is charged inductively, since contact is made by a brush of fine brass wire which permits the escape of the electricity of the same kind as the charge of the field-plate. The carrier thus charged then passes the collecting combs, where it communicates to them a portion of its charge, and is then discharged by a neutralizing brush similar to that with which contact was first made, and connecting with the field-plate, thus increasing its charge. The same process takes place at the opposite side of the plates; only the kind of electricity is changed, with the result that the process is continuous. The electricity from the collecting combs passes to Leyden jars, where it is collected. In the Wimshurst machine, which is shown in Fig. 3, both plates are movable, revolving in opposite directions. Each plate carries a series of tinfoil sectors which not only serve as carriers of the charges, but also as inducting plates. The brushes and collecting combs possess essentially the same functions as in the Töpler machine. In the Holtz machine, shown in Fig. 4, there are two glass plates, one of which is solid and mounted on an axle, capable of revolution, while the second plate is fixed and has a central opening through which the axle passes, and two windows through which pointed strips of paper project so that they are in contact or nearly in contact with the revolving plate. Below the window on the fixed plate are attached two pieces of varnished paper connected with the points, which serve as field-plates, and opposite to these plates on the farther side of the revolving disk are the collecting combs. One field-plate is charged by contact with an electrified body, such as a piece of hard rubber, and the electricity of the same kind, in this case negative, is driven from the opposite side of the revolving plate at the combs, leaving the glass plate with a positive charge. The plate thus charged revolves and the charge is brought opposite the field-plate on the other side. Here negative electricity is drawn from the combs, leaving that knob of the prime conductor with a positive charge, while a positive charge is also given to the field-plate. The inductive effect becomes greater as the disk is revolved, and as a result we have one set of field-plates and the combs and conductors opposite them charged positively, while the others are negatively charged. The knobs of the conductors are at first in contact, but after a few revolutions of the disk they may be separated and a series of sparks produced whose length can be increased as long as the difference of potential is sufficient to overcome the air-gap.

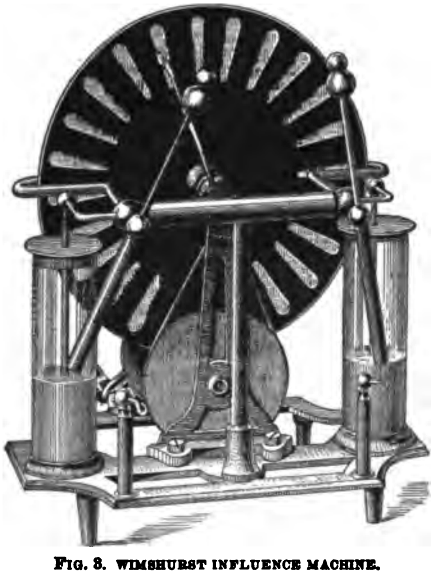


FIG. 3. WIMSHURST INFLUENCE MACHINE.

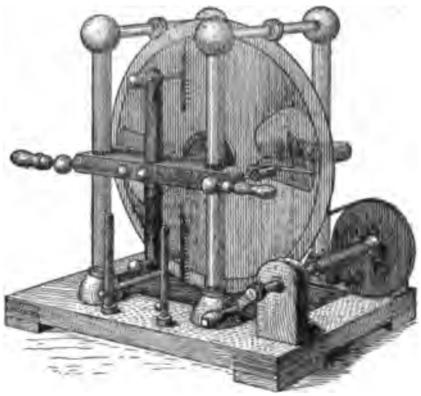


FIG. 4. HOLTZ ELECTRICAL MACHINE.

In a number of these electrical machines, plates of rubber or vulcanite are substituted for glass disks; and the effect is also intensified by increasing the number of disks carried on the same axle, together with the combs, conductors, and other appliances. In the best of these machines sparks over a foot in length are obtained. In electrical machines, as in the case of all apparatus where electricity at high potential is used, the greatest care must be observed in insulating the different parts and conductors. Particularly, all glass parts on which the moisture of the atmosphere is likely to settle must be covered with shellac, varnish, or paraffin. Electrical machines are available for many experiments in static electricity, but save for igniting gas-jets for use in electro-therapeutics they have few practical applications in ordinary life. They will be found described in a simple manner in S. P. Thompson, *Elementary Lessons in Electricity and Magnetism* (New York, 1902). An interesting historical discussion is given in Gerland and Traumüller, *Geschichte der Physikalischen Experimentierkunst* (Leipzig, 1899). The advanced student may consult with profit the various volumes of the *Annalen der Physik*, and such treatises as Müller-Pouillet Pfaundler, *Lehrbuch der Physik*, vol. iii. (Brunswick, 1888-90); Wüllner, *Lehrbuch der Experimental Physik* (Leipzig, 1895); and Gustav Wiedeman, *Die Lehre von der Electricität* (Brunswick, 1882-85). See articles Electricity; Electrophorus.

ELECTRICAL UNITS. In order to express by numbers the amounts of the different electric and magnetic quantities, various units or standards of comparison are necessary. They are all based upon the definition of a unit electrical charge and of a unit magnetic pole.

The C. G. S. Electrostatic system starts with the following definition: A unit electric charge is such a one that if two particles of matter, placed in a vacuum at a distance of one centimeter apart, are each charged with a unit charge, the force of action of one on the other will be one dyne. Based on this definition are the following units: Two points are at a unit difference of potential, if it requires one erg to carry a unit charge from one point to the other. The capacity of a condenser is unity, if, when charged to a unit difference of potential, there is a unit charge on each plate of the condenser. A unit current is such that if it flows for one second, an electric charge equal to unity is carried. On this unit current all the magnetic quantities could be based.

The C. G. S. Electric-magnetic system starts with the following definition: A unit magnetic pole is such that if two such poles are at a distance apart of one centimeter in a vacuum, the force of action of one on the other is one dyne. On this definition is then based that of a unit electric current, viz., it is such a current that, if it is flowing through a linear conductor bent in the form of a circle of radius r cm., the force on a unit magnetic pole placed at the centre of the circle is $2\pi/r$, where as usual $\pi = 3.14159$. A unit quantity is then the charge carried by a unit current in one second, and to this can be referred units of potential and capacity; a unit electromotive force between two points is such that it requires one erg to carry a unit quantity between them, or if a unit current is flowing between them an amount of energy equal to one erg is set free in one second; a linear conductor of unit resistance is such that if a unit electro-motive force is applied at its ends a unit current will be produced; a unit of induction is the induction in a circuit when the electro-motive force induced in this circuit is unity while the inducing current varies at the rate of a unit current per second.

Experiments have established the connection between the units for the same quantity in the two systems. Knowing this ratio for any quantity, e.g. electric current, it may be at once deduced for the others. It is thus established that

Electrostatic unit Electro-magnetic unit
of quantity or current = of quantity or current $\div v$
of potential or E.M.F. = of potential or E.M.F. $\times v$
of capacity = of capacity $\div v^2$

where $v = 3 \times 10^{10}$ or 30,000,000,000 very approximately. This is the same number as that expressing the velocity of light as it should be according to the electro-magnetic theory of light, which identifies the luminiferous ether with the medium serving for the propagation of disturbances due to electric oscillations. See Light; Electricity.

These C. G. S. electro-magnetic and electrostatic units are, in nearly every case, of inconvenient magnitude for practical purposes; and, further, their definitions are not such as lead easily and directly to methods of measurement. Consequently, certain so-called 'practical units' have been adopted which are of convenient magnitude and bear simple relations to the absolute units, so far as possible. The following are these practical units, as legally defined: The unit of resistance shall be what is known as the international ohm, which is substantially equal to 1,000,000,000 units of resistance of the centimeter-gram-second system of electro-magnetic units, and is represented by the resistance offered to an unvarying electric current by a column of mercury at the temperature of melting ice, 14.4521 grams in mass, of a constant cross-sectional area, and of the length of 106.3 centimeters. (This would require a cross-section of 1.00003 square millimeters, according to the accepted value for the density of mercury.) One million ohms—i.e. 10^6 ohms, is called a 'megohm.'

The unit of current shall be what is known as the international ampere, which is 0.1 of the unit of current of the centimeter-gram-second system of electro-magnetic units, and is the practical equivalent of the unvarying current, which, when passed through a solution of nitrate of silver in water, in accordance with standard specifications (see Ampere), deposits silver at the rate of 0.001118 of a gram per second. One thousandth of an ampere is called a milliampere.

The unit of electro-motive force shall be what is known as the international volt, which is the electro-motive force that, steadily applied to a conductor whose resistance is one international ohm, will produce a current of an international ampere, and is practically equivalent to $\frac{1000}{1434}$ of the electro-motive force between the poles or electrodes of the voltaic cell known as Clark's cell, at a temperature of 15° C., and prepared in the manner described in the standard specifications. See Volt.

The unit of quantity shall be what is known as the international coulomb, which is the quantity of electricity transferred by a current of one international ampere in one second. See Coulomb.

The unit of capacity shall be what is known as the international farad (see Farad), which is the capacity of a condenser charged to a potential of one international volt by one international coulomb of electricity. One-millionth of a farad is called a microfarad.

The unit of work shall be the joule, which is equal to 10,000,000 units of work in the centimeter-gram-second system, and which is practically equivalent to the energy expended in one second by an international ampere in an international ohm.

The unit of power shall be the watt, which is equal to 10,000,000 units of power in the centimeter-gram-second system, and which is practically equivalent to the work done at the rate of one joule per second. One thousand watts is called a kilowatt.

The unit of induction shall be the henry, which is the induction in a circuit when the electromotive force induced in this circuit is one international volt while the inducing current varies at the rate of one ampere per second. See HENRY.

ELECTRIC ARC. The effect produced when an electric current is maintained between two electrodes or terminals at a gap or opening in the circuit. This phenomenon involves the production of light and the generation of heat, and consequently the arc is employed for purposes of illumination as well as for producing high temperatures. The arc is distinguished from a spark in that the latter is of extremely brief duration and has a disruptive character, whereas in the case of the arc the vapor produced by the volatilization of the extremity of the electrodes is raised to a high temperature and forms a path across which a continuous discharge takes place. Sir Humphry Davy in 1800 exhibited to the Royal Institution apparatus where a continuous spark was produced in a gap between two pointed pieces of charcoal, whether they were in air, or in water, or some other liquid. In 1808 Davy, by using a battery of 2000 elements, produced an arc nearly four inches in length. In 1843 carbon conductors formed from gas-coke instead of charcoal were made use of by Foucault, and later various substances were introduced into the carbons in order to increase the length of the arc and make it more steady.

The first essential of an arc is an electric current of sufficient tension to force its way across the gap or opening where the arc is to be produced. Unless there is a very large difference of potential on both sides of the gap, there must first be contact between the two carbons or other electrodes while the current passes, and then after they have been separated the arc will be produced. As the terminals are separated a minute spark is produced, and a part of the carbon or other material is volatilized and made conducting. The heat thus produced is so intense that it is necessary to employ electrodes of a highly refractory material, in order to prevent their melting or too rapid vaporization, and it is for this reason that use is made of carbon terminals. The arc can be produced by either an alternating or direct current from a battery or dynamo. A pressure of about 45 volts is required to maintain an arc between carbons in the open air; if the carbons are enclosed so as to prevent the escape of the carbon vapor formed, as in the modern enclosed arc lamps, a pressure of about 75 volts is required. The current varies with the size of the carbons, in commercial practice about 10 amperes for the open arc and 6.5 amperes for the enclosed type. The carbons, when used for lighting, are generally placed vertically above each other, and the positive carbon is distinguished by the formation of a crater, which is the most brilliant source of light as well as the place of most intense heat, being at a temperature of about 3500° C. (Violle). The negative carbon takes a pointed shape, but is consumed only one-half as rapidly as the positive. Both carbons are incandescent at their tops, and from these sources considerable light is emitted, though about 85 per cent. of the total amount comes from the crater just mentioned. The arc itself furnishes only about 5 per cent., while the remaining 10 per cent. comes from the negative carbon. The arc is affected by the magnetic influences, and the bow-shaped arc is produced with vertical carbons by the action of the earth's magnetism. It was from this curved appearance that the arc took its name. Many interesting effects take place in the arc, one of which is the change from carbon to graphite experienced in the electrodes of arc lamps. The composition of the light furnished by the electric arc varies with the material of the electrodes, and even with different qualities of carbon. However, the light in general resembles sunlight, but is richer in violet rays. An electric arc formed between carbon electrodes will be found to consist of a central portion of violet hue, which is doubtless the vapor of the carbon rendered incandescent at the crater. Surrounding this is a non-luminous portion where a dark flame indicates that the oxygen of the external air is being combined with the carbon and carbon monoxide produced. Outside of this is a luminous flame where the carbon monoxide is further oxidized and carbon dioxide formed. The character of the arc found between carbon electrodes impregnated with certain metallic salts—the so-called "flaming arc"—is quite different. In such arcs the arc flame itself is rendered intensely brilliant by the luminosity of these metallic vapors, due to the great heat of the arc, and only a very small portion of the light comes from the crater. Such arcs give from three to five times the illumination of an ordinary arc. The color of the light depends on the salts used, but is usually a warm orange yellow. There are also certain substances which can be used as electrodes between which an arc can be established with but a comparatively slight elevation of temperature, but with an arc flame of great luminosity. In this class belong most vacuum arcs, such as the mercury arc, which is the source of light in the recently developed Cooper-Hewitt Mercury Lamp. The color of this light is a decided greenish-blue, which largely offsets the advantages resulting from the high efficiency of the lamp.

For a description of the mechanical features of the various forms of arc lamps and the apparatus used in the various arc lighting systems, see the articles on ELECTRIC LIGHTING, DYNAMO-ELECTRIC MACHINES, and TRANSFORMERS. The application of the arc in the production of high temperatures for metallurgical processes is discussed in the article on *Electric Furnaces*. For a fuller description of the electric arc in reference to practical conditions in electric lighting, see Crocker, *Electric Lighting*, vol. ii. (New York, 1901). A popular treatise on electricity, in which some attention is paid to the arc and its phenomena, is Thompson, *Elementary Lessons in Electricity and Magnetism* (New York, 1901). For a comprehensive treatment of the arc, see Mrs. Ayrton, *The Electric Arc* (New York, 1902).

ELECTRIC BELL. See BELL.

ELECTRIC BURGLAR ALARMS. See Alarm.

ELECTRIC CLOCK. See Clock.

ELECTRIC COLUMN. See Dry Pile.

ELECTRIC DISCHARGE. See Electricity.

ELECTRIC FISH. A fish which possesses the power of discharging electricity at will. Electric organs are well developed in three sorts of fishes: (1) Most strongly in the Brazilian electric eel; (2) in a genus (Malapterurus) of African catfishes; and, (3) most weakly, in the torpedo family of rays. Electric organs are present, but developed to a much slighter degree, in some other fishes, which are spoken of as pseudo-electric. The organs are modified muscular tracts and nerve-connections, by means of which the fish are able to give an electric shock. They lie, in the case of the torpedo, in the head and gill region; in the South American eel they are on the ventral surface of the long tail; and in Malapterurus they practically incase the entire body, or occur in lateral lines under the skin on each side of the tail. The electro-motive force seems to be under the influence of the central nervous system, and the nerves supplying the organs are enormously developed. In the torpedo the 'electric plates' are arranged vertically, and the current passes in the same direction from the lower to the upper side. In the other two they are arranged longitudinally, and the current in Gymnotus passes toward the head and in Malapterurus toward the tail. The discharge, when the animal is at its best, may stun an animal as large as the horse. This power is of use, doubtless, in defense, and probably in capturing smaller prey.

Electric Eel. This fish (*Gymnotus*, or *Electrophorus, electricus*) inhabits the rivers of the basin of the Amazon and Orinoco, wherever they are warm and sluggish. It is in shape like a thick, stout, blackish, scaleless eel, and may grow to be six feet long; but it differs so much in structure from ordinary eels that it has been set apart as a separate family or other group by Cope, Gill, and other ichthyologists. It is abundant, and seems to have the general food and habits of an eel, but little is known in regard to its generation or the use of its battery, except that it habitually kills more fish than it can consume. The flesh is filled with bones, but is said to be palatable, and is not only eaten, but is regarded by the native South Americans as having medicinal value.

Electric Catfish. These shock-giving catfish compose the subfamily Malapterurinæ, of which the best known is the raash (*Malapterurus electricus*) of the Nile. It grows to a length of four feet, with the ordinary rayed dorsal fin replaced by a fatty dorsal fin just in front of the rounded tail. It is said to give a shock like that from a Leyden jar, which may be communicated by touching the creature with a conductor. Two other species are known.

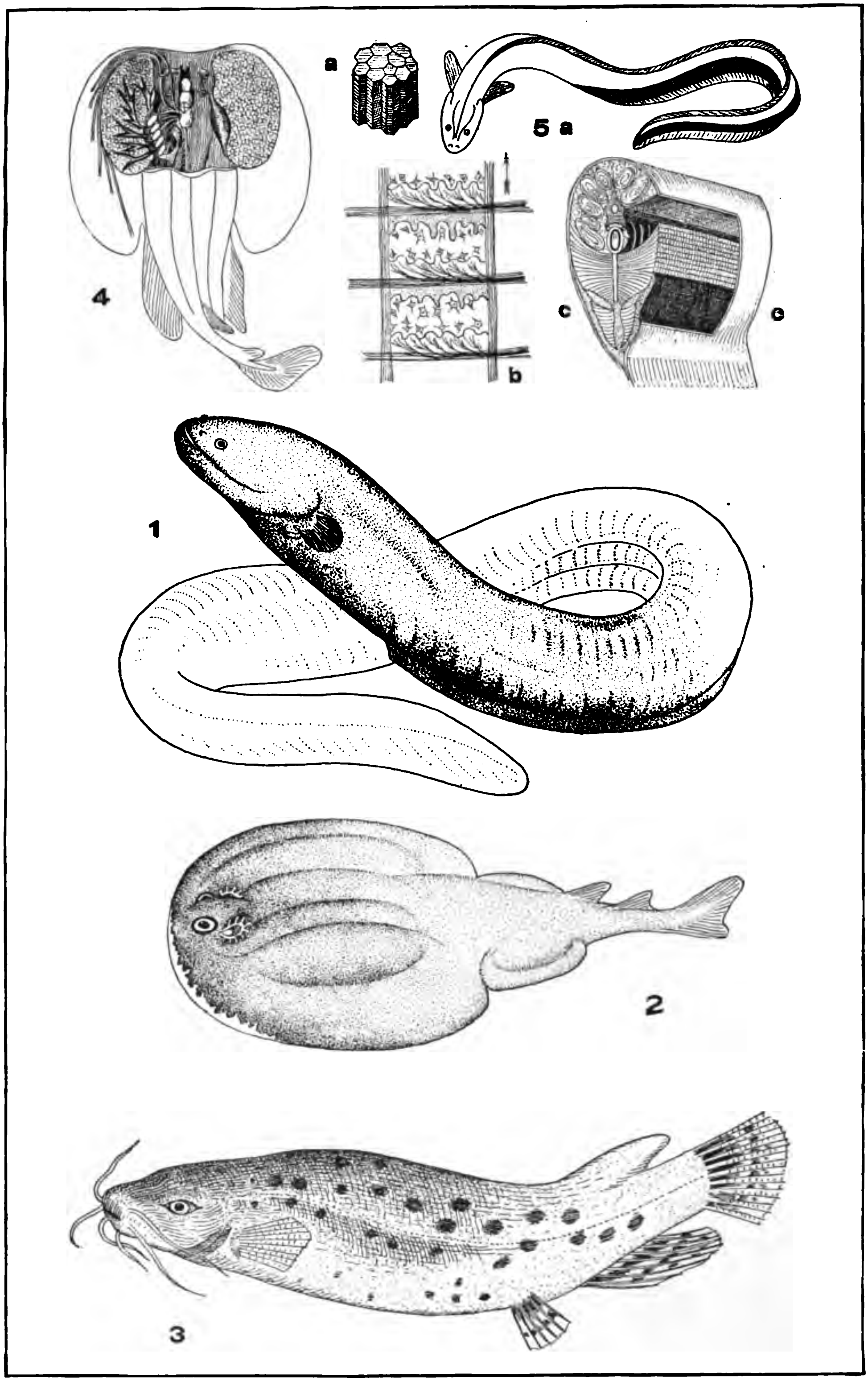
The Torpedo. The electric rays, or torpedoes, constitute a family closely allied to the true rays. They embrace about six genera and fifteen species of the warmer seas of the world, and two species which approach our southern shores. They have rounded, disk-like bodies, with powerful tails, and may weigh 80 pounds; swim close to the bottom, and are dark-colored above and light beneath, like other fishes of their class. The best-known species is *Torpedo marmoratus* of southern Europe, upon which Dr. Gunther, ichthyologist of the British Museum, made the following observations: He found that the phenomena attending the exercise of this extraordinary faculty closely resembled muscular action. The power is exhausted after some time, and it needs repose and nourishment to restore it. If the electric nerves are cut and divided from the brain, the cerebral action is interrupted, and no irritant to the body has any effect to excite electric discharge; but if their ends be irritated the discharge takes place, just as a muscle is excited to contraction under similar circumstances. And, singularly enough, the application of strychnine causes simultaneously a tetanic state of the muscles and a rapid succession of the involuntary electric discharges. The strength of the discharges depends entirely on the size, health, and energy of the fish. It seems to be "essential and necessary to them for overpowering, stunning, or killing the creatures [fish of various kinds] on which they feed, while incidentally they use it as the means of defending themselves from their enemies."

Anatomical Features. The electric organs in all the above-named fishes are to be regarded, according to Wiedersheim, as metamorphosed muscular tracts, and the nerve-endings belonging to them as homologues of the motor end-plates which are ordinarily found on muscles. As regards the minute structure of the electric organs, the same essential arrangements are met with in all the forms. The framework is formed of fibrous tissue, which gives rise to numerous polygonal or more or less rounded chambers (see Plate). Numerous vessels and nerves ramify in the connective tissue lying between these compartments, the nerves being inclosed in very thick sheaths, and having a great variety of origin, according to the species. In torpedo they arise from the 'electric lobe' of the medulla oblongata, a single branch coming also from the trigeminal; in all pseudo-electric fishes, as well as in Gymnotus, in which over 200 nerves pass to the electric organ, they arise from the spinal cord. The electric nerves of Malapterurus arise on each side from a single enormous nerve-cell, which, lying in the neighborhood of the second spinal nerve, is continued into a very large primitive fibre, which passes toward the end of the tail, dividing as it goes.

The end-organs in which the nerves terminate are disks, called 'electric plates,' formed of muscle-substance over one or the other side of which, according to the species, the terminal filaments of the nerve spread out. The side of the electric plate on which the nerve branches out is negative at the moment of discharge, while the opposite side is positive, and thus the different arrangements of the parts in Gymnotus and in Malapterurus render it clear that the electric shock must pass in different directions in these fishes—thus, in Malapterurus it passes from the head to the tail, but in the contrary direction in Gymnotus. In torpedo the discharge passes from below upward. The mechanism whereby the electric plates become temporarily charged with electricity is not known.

Bibliography. Although the peculiar powers of the torpedo and of the gymnotus were well known to the ancients, the first scientific determination of the electrical character of the shock of the torpedo was by Walsh, in 1772—*Of the*

ELECTRIC FISH



1. ELECTRIC EEL (Gymnotus electricus).
2. ELECTRIC RAY (Torpedo marmorata).
3. ELECTRIC CATFISH (Malapterurus electricus).
4. ELECTRIC ORGANS OF TORPEDO: a, polygonal rods.
5. ELECTRIC EEL (Gymnotus): a, situation of electric organ (black strip); b, structure of the same, enlarged; c, cross-section of eel's body, showing relative size and position of electric organ (e).

Electric Properties of the Torpedo (Philadelphia, 1773). From that date the electric organs of fishes have been made the object of special study by some of the greatest anatomists and physiologists, among them Jobert de Lamballe, who published a special work entitled *Des appareils électriques des poissons électriques* (Paris, 1858), accompanied by a magnificent volume of plates. More recent works are: Boll, *Ueber elektrische Fische* (Berlin, 1874); Sachs, *Untersuchungen am Zitteraal* (Leipzig, 1881); Fritsch, *Die elektrischen Fische* (ib., 1887-90); Schönlein, *Beobachtungen und Untersuchungen über den Schlag vom Torpedo* (Munich, 1894); Gunther, *Study of Fishes* (London, 1880); Wiedersheim, *Comparative Anatomy of Vertebrates* (London, 1897).

ELECTRIC FURNACE. Strictly speaking an electric furnace is an apparatus for bringing about a physical or chemical change in materials by aid of heat obtained from the transformation of electric energy; the term, however, may be extended to include "electrolytic furnaces," in which the action is in part electro-thermal, as in the electric furnace pure and simple, and for the rest electrolytic. This class of furnace is mainly employed for the electrolysis of fused salts, as for instance, in the manufacture of aluminum, where a high heat is necessary to maintain the requisite fusion of the electrolyte.

The limit of heat practically obtainable, with the use of ordinary refractory materials is very high, because in the electric furnace the fusing material is at a higher temperature than the crucible, whereas, in ordinary fusion, the temperature of the crucible exceeds that of the material fused within it. The maximum temperature practically obtainable in non-electric furnaces is about 2000° C., whereas a temperature as high as 3500° C. is easily reached and maintained in the commercial electric furnace.

Electric furnaces may be classified according to the method in which the heat is produced, as arc furnaces and resistance furnaces. The arc furnace consists essentially of an electric arc (see Electric Arc) usually with carbon electrodes enclosed in a chamber made of material which is both highly refractory and a poor conductor of heat, as, for example, fire-brick or chalk. In the resistance furnace the heat is produced by the passage of an electric current through some highly refractory material, as carbon, or some of the rare metallic oxides (such as those used in making the glowers for Nernst lamps) embedded in the wall of the furnace, or the heat may be developed directly in the material to be treated by using the latter as the conductor of the current. A very convenient form of resistance furnace is the so-called "induction furnace"; in this furnace the resistance element, either the furnace charge or some auxiliary material, instead of being connected directly with the circuit supplying the current, forms the secondary of a transformer (see Transformer); a small current at a comparatively high voltage in the primary of many turns induces the necessary large current at low voltage for heating the material to be treated, which forms a single turn secondary.

Electric furnaces are used chiefly in the manufacture of aluminum, calcium carbide, carborundum, phosphorus, special grades of iron and steel, and ferro-manganese. (See Electro-Chemistry, Industrial.) One of the simplest industrial applications of the resistance principle is found in the Acheson furnace used in the manufacture of carborundum. The furnace consists of a trough built up of loose bricks, with massive electrodes made up of a bundle of carbon rods projecting through the end walls. Between these electrodes lies a core of granular carbon, coke, or carbon rods. Around this core is packed a mixture of powdered coke, sand, and a small quantity of sawdust and common salt. The electrodes are then connected with the source of electric energy, and the proper current maintained flowing through the core to raise the temperature of the mixture of sand and coke to the point required for the combination of the silicon and carbon. In the furnaces used at Niagara this conversion takes about 36 hours. These furnaces are 15 by 7 by 7 feet. The electrodes consist of bundles of sixty 3-inch carbon rods, each 2 feet long. The coke resistance core is 9 feet long by 2 feet in diameter. The power required to operate such a furnace is about 1000 horse power, or an energy consumption of approximately 4 kilowatt-hours per pound of carborundum.

The application of the induction furnace to the production of high grade steels is rapidly coming into prominence, particularly in Europe. A typical plant of this kind is at Gysinge. Sweden, employing electric furnaces designed by F. A. Kjellin. In the latest Kjellin furnace, about 2 tons of steel can be produced at one charge, or 1500 tons per annum. The advantage of the induction type of furnace in the manufacture of steel lies in the suppression of the electrodes, impurities from which in any other type of furnace would contaminate the molten mass of steel.

Kjellin's furnace consists of an annular groove or hearth, built of refractory bricks, and closed in at the top by refractory covers, which are removable for charging purposes. Centrally, within this ring, is placed one leg of a rectangular iron core, built up of thin sheet-iron laminations. On this core is wound a coil of copper wire of a large number of turns. The metallic charge in the groove forms a second coil of one turn, so that electrically the furnace is simply a step-down transformer with large transformation ratio. Current is supplied to the primary winding at 3000 volts, and the ratio of transformation is such that the current through the furnace charge is about 30,000 amperes.

The raw materials employed to charge the furnace are pig and wrought iron, fed into the furnace along with scrap steel, in the proper proportions to give the desired quality of steel. The energy consumption is approximately 0.45 kilowatt-hours per pound of steel produced.

The following table shows the kilowatt-hours of energy consumed per pound of steel in the various steps in steel-making by means of the electric furnace:

Steel from the ore	1.25 — 1.45	kw-hr. per lb.
" " cold cast iron	.45 — .50	" "
" " " " " and scrap	.40 — .45	" "
" " fused cast iron	.20 — .25	" "
" " " " " and cold scrap	.32 — .36	" "

In general, the commercial use of electric furnaces is limited to those processes where a specially high temperature is required, or where the substances under treatment must be maintained in a pure state; and then only when electric power can be obtained at a comparatively low cost, as for example, in localities where there is an abundant supply of water power. See Wright, *Electric Furnaces and their Industrial Applications* (New York, 1905); Moissan, *Le Four Electrique* (Paris, 1897); also the current electrochemical journals.

ELECTRIC FUZE. See FUZE.

ELECTRIC GENERATOR. See DYNAMO-ELECTRIC MACHINERY.

ELECTRIC HEATER. Electric heaters consist essentially of coils or circuits of some refractory metal through which the current is passed, these coils or circuits being surrounded by air or some insulating material, and the whole being placed in a metallic box or radiator, which throws off or radiates the heat produced. In the simplest form of electric heater exposed coils of wire or strips of metal are wound around insulating material or left surrounded by air. Another common form consists of wire or strips of metal imbedded in asbestos, either in the form of coils or in flat layers. A third class of heater, is made by imbedding the resistance wire in some fireproof insulation, such as enamel or glass. The Tommasi heater consists of a coil of wire imbedded in a material having great latent heat of fusion, such as crystallized acetate of sodium and hyposulphite of sodium. In these heaters the current is turned on until the desired temperature has been reached, and is then turned off and the latent heat allowed to dissipate itself. It is claimed that the heater remains active about four hours after the current is shut off. The Prometheus system consists of a broad strip of rare metal fused on to an enamel which forms the outside of the vessel, and the current is passed through the metal strip or film. In the recent forms of this heater the heating films of gold or platinum between mica sheets are used. In some cases an efficiency as high as 95 per cent. can be obtained. The Le Roy system consists of inclosing sticks of crystallized carbon in glass tubes. In the Parville heater there are rods of metallic powder mixed with fusible clay, compressed under a pressure of 2000 kilograms per square centimeter and baked at a temperature of 1350° C. Unless electricity is produced at a very low cost, it is not commercially practicable for heating residences or large buildings. But the electric heater can be used advantageously in heating small offices, bathrooms, street railway waiting-rooms, for heating electric cars, etc. For heating laundry irons it is commonly figured that electrically heated and gas-heated irons are on a par in economy when gas costs $1.00 per 1000 cubic feet and electricity costs 1 cent per kilowatt hour. The efficiency of electric cooking apparatus varies from 60 per cent. to 90 per cent. (for ovens), depending upon a number of variable conditions, such as time, size, quantity to be heated, and temperature rise. Of the total energy given off by burning a pound of coal in an ordinary cooking-stove only about 2 per cent. is effective in the actual process of cooking, 12 per cent. being wasted in obtaining a glowing fire, 70 per cent, going in the chimney, and 16 per cent. being radiated into the room. The efficiency of a gas stove is considerably greater, for some operations, being as high as 20 per cent., but for ordinary cooking, 15 per cent. is a fair average. The most economical system for cooking or heating is not necessarily the one that has the highest efficiency; the cost of the particular form of energy must also be considered. In New York, in 1906, one dollar would buy 10 kilowatt-hours of electric energy, 1333 cubic feet of gas, or 301 pounds of coal. Ten kilowatt-hours are equivalent to 8570 heat units; when burnt under suitable conditions, 1333 cubic feet of gas are capable of rendering 227,000 heat units; 301 pounds of coal burnt in an ordinary range will yield about 2,900,000 heat units. The number of effective heat units in each case will be proportional to the efficiency of the respective types of stoves; for the electric oven at 85 per cent. efficiency, 7284 heat units; for the gas stove at 15 per cent. efficiency, 34,050 heat units; for the coal stove at 2 per cent. efficiency, 58,000 heat units. For the same results, electricity costs about eight times as much as coal and five times as much as gas. The advantages possessed by electric heaters as regards cleanliness and convenience, however, in many cases offset their lack of economy, and there are in use at present numerous devices, such as electric irons, broilers, chafing dishes, warming pads, and small radiators; in some places where electric power is cheap, even whole kitchen and laundry outfits have been installed. In a gas-stove, considering the number of heat units obtainable at a certain price to be small compared with solid fuel, the ventilating current required for the operation alone consumes at least 80 per cent. of the heat units obtained by burning the gas. In an electrical oven more than 90 per cent. of the heat energy can be utilized; and thus, although 5 to 6 per cent. only of the heat energy of the fuel is present in the electrical energy, 90 per cent. of this, or 4½ per cent. of the whole energy, goes into the food; thus the electrical oven is practically twice as economical as any other oven. See WELDING; ELECTRO-CHEMISTRY, GENERAL.

ELECTRICITY. Few sciences can claim as great an antiquity as that of electricity. It is believed that Thales of Miletus (c.640-546 B.C.) knew that amber, after being rubbed, acquired the property of attracting light bodies; and Theophrastus (c.372-287 B.C.), in his treatise *On Gems*, mentions the fact that this power is not peculiar to amber. No definite scientific information was acquired, however, until the close of the sixteenth century. William Gilbert (q.v.) published in 1600 his great work *De Magnete*. In this book he used for the first time the terms 'electric force' and 'electric attraction,' and distinguished between 'electrics' and 'non-electrics'—the former name being given to bodies which act as amber does when rubbed, the latter to bodies, such as metals, which, when held in the hand and rubbed, do not acquire the power of attraction. He clearly distinguished between magnetic and electric action, as Cardan (1501-76) had also done before, but in an imperfect manner. Robert Boyle, Sir Isaac Newton, and others made many interesting observations on electrical phenomena, the former showing that electric attraction takes place through a vacuum. Otto von Guericke, the inventor of a rude form of electrical machine (q.v.), also discovered electric induction, the phenomena of which were studied with special care by Canton nearly a century later. Hawksbee made several important advances, being the first to show how to electrify metals by rubbing, and also the first to observe that electric charges are only on the surfaces of metals, not in the interior.

During the eighteenth century electric phenomena were studied very extensively, especially toward its close, when means of producing electric currents were discovered. Stephen Gray (q.v.), in the early part of the century, observed the important fact that electric forces could be carried for a considerable distance by means of pack-thread and other bodies, thus discovering electric conduction, and he was then led to distinguish between conductors and non-conductors. The possibility of two kinds of electricity—vitreous and resinous, or positive and negative—was established independently by du Fay in France and Kinnersley in Philadelphia. The former developed also a two-fluid theory of electricity which persisted for many years. The Leyden jar was discovered by accident in 1745, and from this time on public exhibitions of electric phenomena were most popular. Most interesting and important work was being done also in America by Benjamin Franklin (q.v.) and a group of his friends. He proposed a one-fluid theory, which, after more than a century of neglect, has reappeared as a possible explanation of the new phenomena concerning 'corpuscles' and ions. Having noticed the effect of points on conductors in discharging bodies, and believing that lightning is an electric phenomenon, Franklin, in 1750, proposed an experiment to test his theory. It was to extend a long, pointed wire upward from a steeple. and to see if electrical charges could be observed at the lower end of the wire when a thunder-cloud passed overhead. The actual experiment was carried out according to these directions in 1752, in France, by Dalibard, and later by Delor, and in the same year Franklin performed his famous kite experiment. Soon after this lightning-rods, which had been suggested by Franklin, became popular both in America and Europe. The main phenomena of pyro-electricity were discovered by Æpinus, Bergman, and Canton, about 1770. Many of the most important facts in electricity which were made known during the nineteenth century by Coulomb, Ohm, and Faraday, were in reality discovered by Henry Cavendish (1731-1810), one of the world's greatest philosophers. He showed that the capacity of a condenser varied with its size and with the non-conductor used; he studied the conducting power of solutions; and he also discovered what is now called Ohm's law. He saw, further, from mathematical considerations, that if electrical charges act on each other with a force varying directly as the amounts of the charges and inversely as the square of their distance apart, then a charged conductor must have its charge entirely on its surface; whereas, if the law of action were different, there would be some charge on the interior. By a most ingenious experiment, performed before 1773, he showed that, to the limit of accuracy of his apparatus, there was absolutely no charge on the interior. These electrical papers of Cavendish were not published until 1879, when they were edited by Clerk-Maxwell. The law of electric action was proved independently and in a less accurate manner by Coulomb (q.v.), in 1785.

Many improvements in electrical apparatus were made; a circular glass plate and a rubber cushion coated with a tin amalgam were substituted for the sulphur globe and the hand as used by von Guericke. The gold-leaf electroscope was invented in 1786, by Abraham Bennet, and was improved by Volta (q.v.). The latter also, in 1775, invented the electrophorus.

In 1780 Galvani (q.v.) made the historic observation in regard to the twitching of the frog's legs, which was followed by the discovery in 1794, by Volta, of the correct explanation. This led at once to the invention of the so-called voltaic pile and voltaic cell, a description of which was communicated by Volta in a letter to Joseph Banks, F.R.S., written March 20, 1800. Means were thus furnished for maintaining electric currents. Within a few weeks after Volta's letter, Nicholson and Carlisle in England constructed a pile, and by means of it observed and studied the decomposition of water.

The progress of the science of electricity during the nineteenth century was so rapid that it is impossible to do more than to note the most important steps. The investigation of the action of an electric current when passed through liquids was continued by Sir Humphry Davy (q.v.) and Michael Faraday (q.v.), to the latter of whom is due the statement of the laws of electrolysis. The theoretical explanation of the phenomena is the work of Grothuss, Faraday, Hittorf, Clausius, and Arrhenius. Improved cells for the production of currents were made by Sturgeon, Daniell, Grove, Bunsen, and others. So-called 'storage' cells, or secondary cells, were first described by Ritter in 1803, and were improved by Planté and by Faure.

In 1819 Oersted discovered the magnetic action of an electric current, and the exact mathematical laws stating the action of a current upon a magnet and of one current upon another were deduced by Biot and Savart (1820) and by Ampère (1821).

Arago and Davy (1820) discovered independently that a current passed through a helical conductor magnetized a steel needle placed inside. Sturgeon, in 1825, made the first electro-magnet, using a single helix of wire wound round a bar of iron shaped like a horseshoe, varnish being used to insulate the coils of the wire. Joseph Henry (q.v.) showed how this magnetic action of a current could be increased. He insulated the wire by means of silk cloth, and wound it in layers like thread on a spool. By means of an electro-magnet made on this principle Henry constructed a telegraph instrument.

The galvanometer was invented by Schweigger, in 1820, and the astatic needle by Nobili, in 1825; but the modern forms of the instrument are due to the genius of Lord Kelvin. The phenomena of thermo-electricity were discovered by Seebeck in 1821; the Peltier effect, in 1834.

The discovery of induced currents was made independently by Henry and Faraday in the years 1829-31; and the latter described the principle of the dynamo which has been perfected in recent years by Wilde, Siemens, Gramme, and countless others. The first induction coil was made by Charles Page, of Washington, D. C., in 1838. In 1842 Henry proved that the discharge of a Leyden jar was oscillatory—in which he had been anticipated by Savary (1827)—and discovered the existence of waves in the ether produced by such a discharge. The mathematical theory of the discharge was given by both Kelvin and Helmholtz, and that of the waves by Clerk-Maxwell. The properties of the waves were investigated by Hertz in 1888, and more recently by Marconi and others, who have made commercial use of them.

To Faraday is due the realization of the importance of the properties of the non-conducting media separating charged bodies. He proved that both electrostatic and magnetic actions take place *through* the media, not 'at a distance.' He originated the idea of lines of induction, and established their laws; he also explained the attraction and repulsion of bodies caused by electrical or magnetic forces as due to the *relative* properties of these bodies and of the surrounding medium. Clerk-Maxwell expressed Faraday's experimental discoveries in mathematical language and formulæ, and advanced the theory of electricity and magnetism which is the basis of all modern theories.

The idea of expressing all electrical and magnetic quantities in absolute units, based on some definite system of standards of length, time, and mass, is due to Gauss (q.v.) and Weber (q.v.).

The most important recent advances in the knowledge of the connection between electricity and matter have come through the observation of the ionization (q.v.) of gases. Most of the researches along this line have been made under the direction of Prof. J. J. Thomson, at the Cavendish Laboratory, Cambridge, England.

To understand the fundamental principles of electricity, it is well to start with the experiments that were performed by the early Greeks.

Here it is found that, if two bodies are brought into intimate contact, e.g. by pressure or by rubbing together, and then separated, they have certain new properties, the most marked of which is the power of attracting any small bits of matter, such as particles of dust or fragments of paper. Bodies possessing this power are said to be 'electrified' or 'charged with electricity.' It is easily observed that if certain bodies, such as glass, rubber, silk, are charged, the electrical effects are manifested only at the points where the contact was made with the other body; while with other bodies, such as pieces of metal, the electrical effects are manifested over the whole body regardless of where the contact was made, and the charge is said to spread over the surface. Bodies of the latter kind are called 'conductors'; of the former, 'non-conductors.' It takes time—infinitesimally short—for a charge to distribute itself over the surface of a conductor; but in the end, unless there is further charging, conditions come into a steady state; the charges are said to be at rest. The science of the distribution and other properties of electrical charges at rest is called 'electrostatics,' while the study of the phenomena involved in varying and moving charges belongs to 'electric currents,' or 'electrokinetics.'

ELECTROSTATICS.

FUNDAMENTAL PHENOMENA. As said before, the primary fact of electricity is that, when two bodies are brought in contact and then separated, they acquire the power of attracting small portions of matter. Further, the two bodies which are thus charged attract each other, as may be shown by suspending one so that it is free to move, and bringing the other near it. If other portions of matter are charged, e.g. pieces of rubber, of dry wood, of cotton cloth, of paper, of fur, it will be observed that, when they are brought near a suspended glass rod which has been charged, there are some cases of attraction and others of repulsion. All charged bodies which attract a piece of glass charged by contact with silk, are said to be 'negatively' charged; and all charged bodies which repel the charged glass are said to be 'positively' charged. It is found by experiment that any positively charged body will repel any other body positively charged; any negatively charged body will repel any other negatively charged body; any negatively charged body will attract any positively charged body.

It is found that glass rubbed with silk is positively charged; but if rubbed with cat's fur it is negatively charged. It is possible to make a tabular arrangement of bodies in which any body when charged by contact with any other body lower down in the series becomes positively charged, the second body becoming negative. Such a table is called the 'electrostatic series'; a few of its members are the following: cat's fur, glass, paper, flannel, silk, cork, metals, ebonite, sealing-wax, sulphur, hard rubber.

As noted above, natural bodies may be divided into conductors and non-conductors; conductors being such bodies as allow charges to spread over them, while non-conductors keep the charges localized where the contact took place—a 'charge' meaning simply a condition at the surface of a body such that there are forces of attraction or repulsion manifested there on other charged bodies or on light pieces of matter. Among the conductors are: all metals, water containing some salt or acid in solution, damp thread, the human body, the earth. Glass, sulphur, paraffin, dry wood, silk, paper are non-conductors or insulators. Thus, if a piece of metal is held in the hand when it is charged, the charge will distribute itself over the metal, the hand, and body, and sometimes over the floor if it is not dry; and, therefore, the charge left on the metal itself may be extremely small. It is necessary, then, in order to charge the metal strongly, to hold it in a piece of paper or other non-conductor. Charges may be transferred from a charged body to an uncharged one simply by allowing their surfaces to touch. If a charge is given a conductor and allowed to come to rest, it is found to be entirely on the surface, not in the interior. Thus there are absolutely no electrical forces *inside* a hollow, closed conductor which is charged, unless a separate charge on a different body is placed inside.

If a charged body is brought near an uncharged one which is separated from the earth by a non-conductor, i.e. is 'insulated,' electrical forces may be observed near the latter of the two bodies; it is said to be charged by 'induction.' If the body which was originally charged was positive, the portion of the other body which is nearest it is now negatively charged, and the portion which is farther away is positively charged. Exactly the reverse is true if the body which was originally charged is negative. If the charged body is now removed to a distance, the 'induced charges' will disappear. If the body which was originally uncharged is joined to the earth by a conductor, and if, after the charged body is brought near, this conductor is removed, the former body will be found to be charged; and this charge will now remain even when the originally charged body is removed. To join a conducting body, e.g. a metal sphere, to the earth by a conductor is most simple; it is necessary to join it by a wire to a gas or water pipe; but to connect a non-conducting body, e.g. a glass sphere, to the earth is not at first sight so easy; it can be done, however, by holding a Bunsen burner so that the flame spreads over the whole surface of the body, because the gases in the flame are good conductors. In both cases, it is evident that the action of the connecting conductor is to make the earth itself a portion of the originally uncharged body; and so the induced charges are distributed, one on the earth and one on the body itself. This last is of a kind opposite to that of the body which originally was charged, and it remains after the connection with the earth is removed.

There are thus three methods of charging a body: (1) By contact with another body and then separation; (2) by contact with another charged body; (3) by induction as just described. The fact that, when a charged body is brought near an uncharged one, there are charges induced on the latter, of such a kind that an unlike charge is nearest the former, accounts for the observed attraction of small particles of matter by charged bodies. It should be noted particularly, however, that the forces of attraction or repulsion between charged bodies vary greatly with the nature of the surrounding medium, being greater in air than they would be in pure water; and the character of the induced charges and the question of attraction or repulsion depend upon the *relative* properties of the surrounding medium and the body on which the induced charges are. The importance of the consideration of the surrounding medium was first emphasized by Faraday, who gave the name 'dielectric' to the material medium around charged bodies, because the electrical actions evidently take place through it. All non-conductors can serve as dielectrics, and so can certain poor conductors under certain conditions. It will be shown later that the potential energy of charged bodies depends directly upon certain properties of the dielectrics in the neighborhood; and whenever any motions of attraction or repulsion take place, they are always such that by the change the potential energy is decreased.

A special case of induction which is of great theoretical and practical importance is one due to Faraday and called the 'Ice-pail Experiment,' because first performed with a metal ice-pail. If a positively charged body, suspended by an insulating cord, is lowered carefully into a nearly closed hollow conducting vessel which is insulated from the earth, in such a manner as not to touch the vessel, positive charges may be observed on the outside of the latter. These charges do not change in any way, however the charged body inside is moved about. If this body is removed, without having touched the vessel, the charges on the latter disappear. Similarly, if a negatively charged body had been lowered into the vessel negative charges would have appeared on the outside. Now, if a charged body, together with the other body with which it was originally in contact and so electrified, is lowered into the vessel, there is no effect on the outside of the latter; the action of one charge neutralizes that of the other; they are said to be of 'equal quantity,' but of opposite sign. Thus, whenever a positive charge is produced, an equal negative charge appears also. In the first experiment, therefore, with the hollow conducting vessel, when a positive charge appears on its outer surface, there must be an *equal* negative charge on its inner surface, which is nearer the positively charged body lowered in from above. If this last body is a conductor, and if it is allowed to touch the hollow conducting vessel, thus forming part of the conductor, two things may be observed: (1) there are no longer any charges inside, everything is discharged; (2) the charges on the outer surface have not changed at all, either in intensity or position. This experiment proves therefore that the positive charge lowered into the vessel induces an *equal* negative charge on the inside of the vessel, and an equal positive charge on the outside. The series of experiments shows, further, that the region outside a closed conductor is unaffected by any production or motion of charges inside. It has been stated before that a charged conductor has all the charge on its outer surface unless a charge is separately introduced inside; so if charges are moved outside a hollow closed conductor there will be no electrical forces inside. Therefore, a closed conductor separates space into two quite distinct portions.

Law of Electrostatic Action. In order to give a numerical value to an electric charge various steps are necessary: (1) Two charges are defined to be equal if they produce the same effect of attraction or repulsion on any third body; in particular, if the two together produce no action, one is equal and opposite to the other. (2) A unit charge is defined to be such that if two particles of matter have each a unit charge and are at a distance of one centimeter apart in a vacuum, the force between them is one dyne. (3) If two or three or four, etc., unit charges are given a body (e.g. by lowering them into a hollow closed conductor), it will exert a force two or three or four, etc., times that which it would if it had a unit charge. To give a numerical value, therefore, to any charge, it is necessary to find that combination of unit charges—either multiples or fractions—which has the same action on any third body as does the charge for which a number is desired. The number of these unit charges gives the numerical value sought. If, now, two particles of matter are electrically charged, one with a quantity e, the other with a quantity e^1, and if they are at a distance apart of r centimeters, the mechanical force of attraction or repulsion is found by experiment to satisfy the law that 'the force varies as the product ce^1 and inversely as r^2.' In symbols, the force

$$f = \frac{ee^1}{Kr^2}$$

where K is simply a factor of proportionality, and is a different constant for different dielectrics. In particular, by the definition of a unit charge, if $e = e^1 = 1$ and $r = 1$, f must equal one dyne if the medium is the pure ether; and therefore on this system of units $K = 1$ for the ether of space free from matter. This system, based on the above definition of a unit charge, is called the 'C. G. S. electrostatic' system. (The 'dimensions' (q.v.) of an electrical charge may be found at once from the above formula. e and e^1 are both charge; and hence a charge has the same dimensions as the square root of Kr^2f. Force has the dimensions MLT^{-2}; therefore the dimensions of a charge are $(KML^3T^{-2})^{\frac{1}{2}}$ or $M^{\frac{1}{2}}L^{\frac{3}{2}}T^{-1}K^{\frac{1}{2}}$. Until something is known of the nature of K, there can be no mechanical understanding of an electrical charge.) That portion of this law of electrostatic action which says that the force varies as ee^1 and inversely as r^2, is known as 'Coulomb's law.' It has been tested experimentally in two ways: one directly, by placing charges at different distances; the other indirectly, for it can be proved mathematically that only if this law is true will there be no electrical force inside a closed hollow conductor, e.g. a spherical shell. Coulomb (1785) applied the first method, which is not accurate; and the second was used by Cavendish (1773) and later by Clerk-Maxwell. The fact that the force depends upon the medium was discovered by Cavendish (about 1772), and later independently by Faraday, who thoroughly investigated the subject.

Electric Potential. In the neighborhood of any charged body, forces are noticed if other charges are brought near or moved about; it is said to be surrounded by a 'field of force.' The 'direction' of the field at any point is defined as that in which a particle of matter positively charged would move, if placed at that point and left free to move. If a line is drawn such that at each of its points its direction gives that of the field, it is called a 'line of electric force.' Such a line evidently starts from a positive charge and ends on a negative one; there is therefore no line inside a closed conductor owing to its charge; further, these lines are perpendicular to the surface of a charged conductor; for, if they were not, there would be a component of the force in the surface itself and consequently there would be motion of the charges, because a conductor is such a body that there is no opposition to a force tending to move a charge; and this would be contrary to the assumption that the charges are at rest.

The work required to bring a particle with a unit positive charge from the surface of the earth to any point in the field of force round a charged body is called the 'electric potential' at that point. (The earth is taken as the starting-point because it is a huge conductor whose electric condition may be assumed to be steady; and this definition of potential is equivalent to defining the potential of the earth as being 0. Potentials are measured with reference to that of the earth, just as temperatures on the centigrade scale are measured with reference to that of melting ice.) If one point has a higher potential than another, it requires work to carry a unit positive charge from the latter point to the former; and hence a force must have been overcome; in other words, lines of force always pass from points of high to points of lower potential. It is evident, further, that the potentials of all points of a charged conductor and of all points inside are the same. Therefore the motion of a positive charge is always from high to low potentials, and that of a negative charge is in the opposite direction.

If a positive charge is separated from a negative one by some medium such as air, glass, or paper, and if the charges are large, the difference of potential between any two points of the field which are close together will also be large, and there will be a strong force tending to move positive and negative charges in opposite directions. This force may become so great that there is a rupture of the material medium, air, glass, or paper, and a 'spark' is seen. The principal action in the spark is to make the medium conducting; and so the positively and negatively charged bodies are joined by a conductor and totally or in part discharged. There are other effects of the spark, notably the thermal and luminous ones. Two conductors of similar shape, separated from each other by a thin layer of dielectric, form what is called an 'electric condenser'; because, if one is charged positively and the other with an equal quantity of negative electricity, the potential of the former is lower than it would be if the latter conductor were absent, and therefore it can be charged with a greater quantity, with less danger of sparks passing off to the earth and thus discharging it.

Common forms of condensers (see Condensers) are parallel plates of tin-foil separated by glass or paraffined paper, coaxial cylinders, etc. One of the most familiar types is the 'Lyden jar,' which consists of a glass bottle coated inside and out, except near the opening, with tin-foil.

It is observed that if a conductor is charged which has sharp points the charge rapidly disappears. This is owing to the fact that the fall of potential from the conductor into the air is most rapid at the points, and thus minute sparks pass off to the air, giving charges to the particles in the air which are then repelled. Similarly, if a charged body is brought near an uncharged insulated conductor which has sharp points turned toward the charged body, the latter induces charges on the conductor. Those on the side near the charged body pass off the points, are carried across, and discharge the former, leaving a charge on the conductor of the same kind as that on the body which was originally charged.

Capacity. If the charge on an isolated conductor is increased, so is its potential, because more work would be required to bring up a unit charge; if the charge is doubled, so is the potential. In mathematical language, the charge equals a constant times the potential. If e is the charge and V the potential, $e = CV$. This constant C depends naturally on the shape and size of the conductor and on the surrounding dielctric; it is called the 'capacity' of the conductor. Similarly, if a condenser is charged with $+e$ and $-e$, and if the potentials of the two conductors are V_1 and V_2, there will be a constant relation between e and $V_1 - V_2$, which may be expressed $e = C(V_1 - V_2)$. This constant C depends upon the shape, size, and distance apart of the two conductors and on the nature of the dielectric which separates them; it is called the 'capacity of the condenser.' It was first observed by Cavendish and later by Faraday that the capacity of a condenser was different for different dielectrics, e. g. air, glass, etc. Thus, if the same charge is given two condensers which are identical except in that one has air for its dielectric and the other glass, it is observed that the difference of potential is greater in the former than in the latter, thus showing that the capacity of the latter is the greater. The ratio of the two capacities was called by Faraday the 'specific inductive capacity' of the glass with reference to air. If, instead of using air as the dielectric, there had been a vacuum, the ratio of the capacity of the glass condenser to the vacuum one would be a constant which is characteristic of glass, and is called its 'dielectric constant.' It can be shown easily that this constant is the K which occurs in the formula for electric action. K is said to measure the 'inductivity' of the dielectric.

It may be proved from mathematical reasoning that the capacity of an isolated sphere of radius R in a medium whose dielectric constant is K is KR; the capacity of a condenser of two parallel plates of area A and at a distance apart d with a dielectric of constant K is $KA/4\pi d$; etc.

Energy. Since when a body is charged by bringing it in intimate contact with another body, e.g. glass with silk, and then separating them, one is charged positively and the other negatively, it requires work to pull them apart. The electrical separation, therefore, has an amount of energy equal to this work. This energy is present as a *strain* in the ether and dielectric which surround the charged bodies, as is shown by the fact that if the charges are too great the dielectric is ruptured—a spark passes. Since charges are always on the surfaces of conductors, it is evident that the material of a conductor yields to whatever stresses accompany charges, and so cannot be under a strain. Faraday has shown that the strain in the dielectric is of the nature of a tension along the lines of force and a pressure at right angles to them. If a condenser has a charge $+e$ and $-e$, and a difference of potential V_1-V_2 between the conductors, the process of charging may be imagined as having begun when there was no charge (and therefore no difference of potential), and that minute quantities of positive charges were carried from one plate to the other, leaving therefore equal amounts of negative on the first plate. In this way the charges will gradually grow to $+e$ and $-e$, and the difference of potential will increase at the same rate from 0 to V_1-V_2, the average difference being therefore $\frac{1}{2}(V_1-V_2)$. The difference of potential between the conductors at any instant is by definition the amount of work required to carry a unit positive charge from one plate to the other; therefore, since in the process of charging the condenser a quantity of positive charge e has been carried across at the average difference of potential $\frac{1}{2}(V_1-V_2)$, the work required is e times $\frac{1}{2}(V_1-V_2)$. In other words, the energy of the charged condenser is $W = \frac{1}{2}e(V_1-V_2)$. Expressed in terms of the capacity, $C = \frac{e}{V_1-V_2}$, this becomes $W = \frac{1}{2}\frac{e^2}{C}$

It has been shown that C varies directly as K, the dielectric constant, which is greater for glass or paper than for air; therefore if in an air-condenser the air could be replaced by glass or paper, keeping the charges unchanged, the energy would be diminished. It follows then, that, since changes take place in nature in such a way as to decrease the potential energy, the paper or glass would be 'attracted' in between the charged conductors. All cases of electric attraction and repulsion may be explained in a similar manner.

Electric Oscillations. If an isolated conductor is charged, there will be a definite distribution of charge over the surface in such a manner as to satisfy the law of electric action; but, if another conductor is brought near it, the distribution will be altered by the new forces due to induction. If now this second conductor is suddenly removed, or if the forces of induction are suddenly destroyed, the charge will return to its original distribution. Before doing so, however, there will be what may be called 'electric oscillations'; that is, if the + charge has been drawn toward one end of the conductor by the forces of induction, then when these are removed it will appear at the farther end, next return toward the first end, etc., gradually coming to its state of equilibrium. These oscillations are extremely rapid, and generally die away very quickly. The simplest mode of producing electric oscillations is to bring close together two conductors and charge them oppositely until a spark passes; this has the effect of joining them with an extremely good conductor. It may be shown that, as a result, the conductor which was charged positively becomes negatively charged, then positively, etc., each successive charge becoming less and less, until finally equilibrium is reached. This is what happens in general when the two conductors forming a charged condenser, e.g. the two coatings of a Leyden jar, are brought so close together that a spark passes. (The analogy to a vibrating pendulum slowly coming to rest is complete.) As a result of this oscillatory discharge, the energy of the charges disappears, it being spent, in part, in producing disturbances in the surrounding dielectric of the nature of waves. These waves are in the ether, and are identical properties with those which affect the sense of sight or temperature, being, however, longer, i.e. of a smaller wave-number. They do not appeal to any human senses, but may be detected by various physical means. See Wireless Telegraphy; Coherer.

Electrical Instruments. Electric charges may be produced by various machines which render the processes of charging by contact or by induction continuous and automatic. The commonest forms are the frictional machine (see Electrical Machines), the electrophorus (q.v.), the induction machine.

Instruments have been devised to measure difference of electric potential both absolutely and relatively. They are called electrometers, and are described under that title elsewhere. See Electrometers.

Faraday Tubes. A convenient mode of describing electrical phenomena is due to Faraday, who pictured the electric field round charged bodies as filled with tubes whose sides were made by lines of force. These tubes join positive with negative charges, and are chosen of such a cross-section that where they meet a charged surface the open end of each tube incloses a unit charge. The tube will have in general a varying cross-section, depending on the paths of the lines of force, and where the electric force is the greatest the tubes are most numerous.

ELECTROKINETICS.

Fundamental Phenomena. If a charged electrical condenser is discharged by joining its two conductors or 'plates' by a *long* conducting wire, it is observed that there is no oscillation, but that the charges disappear and there are certain phenomena in and near the wire. The temperature of the wire is raised; and a magnet suspended, free to turn, near the wire and parallel to it, will be deflected so as to tend to stand at right angles to it. In special cases, other phenomena may be observed. The whole phenomenon is described by saying that an 'electric current' has passed through the wire, in the direction from high potential to low, carrying the quantity of electricity e, where $+e$ and $-e$ were the charges in the condenser. In this statement there are three *definitions:* that of 'electric current,' 'direction of the current,' and the 'quantity carried by the current.' The two effects of the current noted are: (1) heating effect in the conductor; (2) magnetic action on a suspended magnet. These actions are observed with all electric currents; and other additional effects are obtained when the current is not steady. It should be noted, further, that, if the direction of the current in the wire is reversed, the heating effect is as before, but the magnet is deflected in the opposite direction. This furnishes an easy method of determining the direction of the current in a conductor. If charges can be supplied to the terminals of the long conducting wire as fast as they disappear—as can be done by using an electric machine or other means—the condition in the wire and around it is said to be that of a 'steady' or 'uniform' electric current. In other words, to maintain a steady current in a wire, its terminals must be kept at a constant difference of potential; and the quantity of positive electricity supplied to one end or of negative supplied to the other in each second of time is called the 'intensity' of the current, or the 'current-strength.' The quantity of electricity carried by the current is evidently the product of the current-strength and the time. The difference of potential between two points on the wire is called the 'electro-motive force' (E. M. F.) between those points. It evidently requires energy to maintain a uniform current, because of the energy spent in thermal actions.

Sources of Electric Currents. To maintain a steady electric current some method must be used which will produce a constant difference of potential. Four may be mentioned: (1) If an ordinary electrostatic machine is used it will be found to give a current of small intensity, the energy for the current coming from the work done in producing the charges by means of the machine. (2) If two wires of different material, e.g. brass and iron, are joined end to end, forming a single circuit, there will be two junctions of brass with iron; and, if these two junctions are kept at different temperatures, there will be (in general) an electric current round the circuit. The energy for this current comes almost entirely from the source of heat at the hot junction; but it may come in part from the fall of temperature of one of the wires. The E. M. F. of the current is, as a rule, extremely small. (See Thermo-Electricity.) (3) If two different solid metals, e.g. rods of copper and zinc, dip into a dilute solution of sulphuric acid in water, the two metals will be found to be at a difference of potential. The same is true of any two metals dipping into any liquid—other than a fused metal—which is an electric conductor. Such an arrangement is called a 'cell' or 'element.' The one mentioned has many disadvantages, some of which may be obviated by using two liquids separated by a porous partition. (For a description of different types of cells, see Voltaic Cell or Battery.) If a cell, as described above, consisting of a zinc and copper rod dipping in dilute sulphuric acid is used to produce a current in a wire joining the projecting ends of the two rods, it is observed that the current in the wire is in the direction from copper to zinc; that the zinc rod wastes away, and the loss in mass of the zinc is proportional to the current-strength and to the time; that bubbles of hydrogen gas form at the copper rod. It is known from chemical experiments that, when zinc is dissolved in a vessel containing dilute sulphuric acid, hydrogen gas is formed and the temperature rises, showing that in the reaction energy is given out. In the simple cell just described the zinc dissolves, hydrogen gas is formed, and the energy liberated is used in producing the electric current. A similar explanation of the supply of energy may be given for all cells, it being noted, however, that in some cases energy is taken from the liquid of the cell itself—apart from chemical action—as is shown by its fall in temperature, and in others energy is given to the cell, as is shown by a rise in temperature. (4) Electric currents may be produced by dynamos (see Dynamo-Electric Machinery), the principle of which will be examined under *induced Currents.*

Heating Effect of Currents. Since in a current through a conductor a certain quantity of electricity is passing from high to low potential, it is losing energy, which in turn is gained by the conductor. Thus, if a quantity e has its potential lowered by $V_1 - V_2$, the loss of energy is $e(V_1 - V_2)$; and this is the energy gained by the conductor. If i is the current-strength, and t is the time taken for a quantity e to pass, $e = it$. $V_1 - V_2$ is the electro-motive force and may be written E. Hence, the energy gained by the conductor is Eit. This goes into heating effects and is manifest by a rise in temperature. Illustrations of this heating effect of a current are furnished by the glow or incandescent lamp, by the arc lamp, by electric furnaces, etc. The incandescent lamp (see Electric Lighting) consists of a thin loop of compressed carbon inclosed in a glass bulb from which as much air as possible has been exhausted, the two ends of the carbon filament being joined to two fine wires of platinum which enter the exhausted space from without. If, by means of these platinum wires an electric current is made to pass through the carbon filament, the latter will be raised to incandescence by the heating effect of the current; but it will not burn, because there is no oxygen in the bulb for it to combine with. The reason for the heating effect being so great in the filament is that it offers a great opposition to the passage of the current, and so a great amount of energy is necessary to force the current through.

The arc lamp consists of two carbon rods so kept by automatic devices that there is a small gap between them. When the lamp is started the rods are in contact, and a current is forced through from one rod to the other; there is a great rise in temperature at the point of contact, owing to the great resistance to the passage of the current—this makes the air a good conductor; then the poles are drawn a slight distance apart automatically; and owing to the resistance to the current passing from the carbon to the air, the carbon tips are heated white-hot and emit light.

Magnetic Action of a Current. If a long, straight wire carrying a current is held over and parallel to a pivoted magnetic needle, the needle will be deflected to one side or the other, depending upon the direction of the current. The simplest statement of the law of the magnetic action of a current is that a wire carrying a current is surrounded by rings of magnetic lines of force, the connection being such that, if a right-handed screw be imagined placed so as to coincide with the conductor, and if it is turned in the manner indicated by the line of magnetic force, its motion of translation will be in the direction of the current.

If the conductor is bent in the form of a loop, lines of magnetic force will enter the loop on one side and return outside the loop, each line forming a closed curve. Thus the face of the loop which the lines enter is like the south pole of a magnet, and the opposite face is like the north pole. In other words, the magnetic action of the loop of wire carrying a current is like a thin sheet of iron filling the area of the loop, and so magnetized that all the north poles are on one face and the south poles on the other.

Similarly, if a wire is wound in the form of a helix or spiral spring, the lines of magnetic force will enter at one end of the helix, pass along its length, and, emerging from the opening at the farther end, return outside, forming closed curves. A helix like this when it carries a current has, therefore, the properties of a bar magnet. If a small magnet is placed inside this helix it will turn and place itself along the line of magnetic force; similarly, if a rod of soft iron or other magnetic substance is wound with an insulated wire helix carrying a current, it will be magnetized. Such a magnet is called an 'electro-magnet,' and in various forms they play an essential part in call-bells, telegraph, and telephone instruments, dynamos, motors, etc. The bar of iron is generally so bent that its two ends face each other; sometimes it forms a 'horseshoe.' One of its ends is then a north magnetic pole, and the other a south pole whenever the electric current is passed through the enveloping helix of wire. Since conductors carrying currents have the magnetic properties of magnets, they have forces of attraction and repulsion on each other and on magnets. It may be shown that all these various cases of force may be embraced in the statement that "motions take place in such a manner that the circuits of conductors inclose the greatest possible number of lines of magnetic force emerging from the north faces of the circuits, or the least number of lines emerging from the south faces." The action of electric motors is based on this principle. See DYNAMO-ELECTRIC MACHINERY.

Many instruments for the detection or measurement of electric currents are based upon their magnetic action. If a magnet is pivoted so as to be free to turn around a vertical axis, and if it is placed in the plane of a loop of wire, it will be deflected if a current is passed through the loop, thus making a 'galvanoscope.' (See GALVANOMETER.) The delicacy of the instrument may be increased in many ways: making the magnet light and short, winding the wire in several turns instead of a single loop, suspending the magnet by a fine fibre with little if any torsional resistance, making the magnet 'astatic.'

An 'astatic' magnet is really a combination of two (or more) magnets rigidly fastened to a stiff rod or 'staff,' and so placed that the directive magnetic action of the earth is destroyed as far as possible. This is done by placing the magnets in *opposite* directions, but in the same plane, and making them as nearly as possible of the same strength. In suspending this compound system in the galvanoscope it is so arranged that one magnet (or set of similar magnets) comes inside the coil of wire, while the other magnet (or set of magnets), turned in the opposite direction, lies outside the coil.

In another type of instrument a flat coil of wire is suspended by a wire which has torsional rigidity between the two poles of a horseshoe magnet, so that the line joining the poles is parallel to the faces of the coil. When a current is passed through the coil it will turn so as to tend to place its faces perpendicular to the line joining the poles, thus including more lines of force. The rigidity of the suspension prevents the coil from turning far; and the turning moment due to the action of the magnet on the current is balanced by the moment of restitution of the twisted wire. This is the principle of the siphon recorder, of the D'Arsonval galvonometer, etc. Still another form of instrument differs from the one just described in having the magnetic field due to the permanent magnet replaced by one due to an electric current through parallel coils of wire, one on each side of the suspended coil, with their faces at right angles to those of the latter. This instrument is called an 'electrodynamometer.'

It should be noted that Rowland has shown by direct experiment that an electrostatic charge carried at a high speed has the same effect on a magnet as a current; the direction of the equivalent current depending upon whether a positive or a negative charge is carried.

ELECTROLYSIS. Metal wires are not the only conductors for electric currents, although they are the ones most commonly seen. Many liquids are conductors, and all gases may be made to conduct. To pass a current through a liquid or a gas, wires must be used so as to conduct the current in at one point and out at another. The wire by which the current enters is called the 'anode'; that by which it leaves, the 'cathode.' Fused metals conduct like solid metals; but in the case of other liquid conductors (and also some solid ones) there are chemical actions at the anode and cathode: gases are evolved or solid matter is deposited on the metal wires or plates. Such conductors are called 'electrolytes,' and the process of conduction through them is called 'electrolysis.' If all electrolytes are examined it is found that they are the solutions of certain salts or acids in some liquid—such as water; and that there is evidence of the dissociation of the salt or acid by the action of the liquid. Faraday found by studying the relative quantities of matter separated out from the liquid at the cathode and anode, when an electric current was passed through an electrolyte, two laws which bear his name: (1) The mass of matter separated at either cathode or anode in any one electrolyte varies directly as the quantity of electricity carried by the current, i.e. as the product of the current-strength and the time. (2) If the same current is passed through several electrolytes in series, the masses of the matter separated out at the different anodes or cathodes vary directly as the 'chemical equivalents' of the matter.

The chemical equivalent of any element is its 'atomic weight' (see ATOMIC WEIGHTS) divided by its 'valence.' For example, the chemical equivalents of a few different substances are given in the following table:

Hydrogen	1
Oxygen	7.98
Copper	31.59
Zinc	32.44
Silver	107.66

Assuming the truth of Faraday's first law, a convenient method is offered for comparing the current-strength of different currents, viz. pass the currents in turn through the same electrolyte and weigh the quantities liberated in the same time. The current-strengths are in the ratio of these masses. This is the principle of the so-called silver or copper 'voltameters.'

Faraday pictured the phenomena of electrolysis as being due to the passage in the electrolyte of two streams of particles—one set charged positively going toward the cathode, the other charged negatively going toward the anode. These carriers of charges he called 'ions'; and he thought of them as giving up their charges to the cathode and anode, and then being liberated from the liquid, as gases or solid deposits, or as then taking part in chemical reactions, and thus liberating other substances. It is easily seen that, if Faraday's laws are exact, all ions of the same substance, e.g. hydrogen, must carry the same charge, in whatever electrolyte they appear; and further, that the charge on any ion is proportional to its valence. (Thus, if the charge on a hydrogen ion is e, that on a copper ion must be $2e$, because the valence of copper is twice that of hydrogen.)[*]

The modern theory of electrolysis is one of the most important branches of physical chemistry. Only its essential ideas need be mentioned here. As it is known by evidence from many sides that an electrolyte consists of a pure liquid in which a salt or acid is dissolved and dissociated into parts, it is natural to identify the ions with these fragments of the molecules of the salt or acid. The theory at present accepted is that by the act of solution in a liquid some substances are dissociated, at least in part; e.g. sulphuric acid in water; that is, some of the molecules of the dissolved substances break up into smaller parts. It is not thought that the parts of a molecule once dissociated remain separated, but that there is a state of dissociation and recombination going on as the molecules and their parts move about through the liquid, and at any instant a definite proportion of molecules are dissociated. It is natural to think that if a molecule is broken into parts, which are then separated, they will be electrically charged, one portion positively, the other negatively. (The charges on any part would then vary as its valence.) If now a difference of potential is produced in the liquid by inserting the anode and cathode, all the positively charged parts will, during their intervals of dissociation, be urged toward the cathode, while those negatively charged will move toward the anode. (It is possible that these dissociated parts do not move freely by themselves, but drag with them definite masses of the solvent.) On this theory, which accounts perfectly for the observed phenomena of electrolysis, the ions are charged fragments of molecules. When they get to the anode or cathode they give up their charges, and combine with other ions, thus forming molecules which are liberated. See DISSOCIATION; ELECTRO-CHEMISTRY, GENERAL.

DISCHARGE THROUGH GASES. There is reason for believing that a pure gas would be a perfect insulator; but all gases can be made conductors in many ways, in all of which there is evidence that the molecules of the gas have been broken into parts—i.e. 'ionized'; although the ions in a gas are by no means the same as in a liquid electrolyte. Some of the methods for ionizing a gas are the following: (1) Application of high temperature, e.g. the gases rising from a Bunsen flame are conductors. (2) Passage of a spark in the neighborhood. (3) Exposure to Röntgen rays or to rays from a radio-active substance, such as uranium (q.v.). (4) Exposure to 'cathode rays' (see below). (5) Exposure to 'ultra-violet light.' (See LIGHT.) One most important fact which seems to be established is that the negative ions of all gases, however these ions are produced, are identical. It can be proved also that the negative ions have less mass than the positive ones. For a full discussion of the recent work on this subject, reference must be made to J. J. Thomson's *The Discharge of Electricity Through Gases* (London, 1902) and to publications by Professor Thomson and his students in the *Philosophical Transactions* (London, current).

One of the most interesting illustrations of the passage of electricity through a gas is afforded when the gas is inclosed at low pressure in a glass tube, into which enter two metal wires serving as anode and cathode. When the gas is at a pressure of a few centimeters of mercury, and a discharge of electricity through the tube is produced by an induction coil or by a number of cells, the gas near the anode is apparently arranged in colored striations across the tube, while near the cathode there is a dark space and over the cathode itself there is a velvety glow. (The light emitted from the tube is characteristic of the gas inside. See SPECTROSCOPY.) As the tube is exhausted further, so that the pressure of the gas decreases, the dark space round the cathode extends through the tube. Finally, if the exhaustion is continued, the character of the phenomenon is changed by the gradual appearance of the 'cathode rays.' These are streams of minute particles of matter negatively charged, which leave the cathode perpendicularly and proceed in straight lines through the gas in the tube. These cathode rays are themselves invisible, but they produce luminous effects where they pass through the gas and where they strike the walls of the tube; at this last place they produce thermal effects also. They produce mechanical motion if they strike any small movable object in the tube. Their path can be deflected by a magnet, proving that they are negatively charged particles moving with great speed—about 25,000 miles per second. If at the end of the tube on which the cathode rays strike there is a small opening covered with a thin sheet of aluminium, similar rays are observed outside the tube. These were first observed by Lenard and are called 'Lenard rays.' Cathode rays affect photographic plates; and, further, wherever they strike any solid obstacles, disturbances in the ether are produced, which in turn cause other radiation. These were discovered by Röntgen and are called 'Röntgen rays' or 'X-rays' (q.v.). The best discussion of cathode rays is given in *Les rayons cathodiques*, by Villard (Paris, 1900).

---

[*] It is evident that the processes of silver or of copper plating are simply cases of electrolysis. (See ELECTRO-CHEMISTRY, INDUSTRIAL.) In the former a solution is made of a silver salt; a plate of silver is used for the anode; the body to be 'plated' is made the cathode; and, as the current is passed through, silver is deposited on the latter and dissolves off the former. Electrolysis is used extensively, too, for the preparation of pure metals, e.g. copper, aluminium, etc. See METALLURGY.

LAWS OF STEADY ELECTRIC CURRENTS. Advantage is taken of the action of an electric current on a magnet to define a 'unit current.' A unit pole in magnetism is defined as such a pole that, if two of them are at the distance of one centimeter apart in a vacuum, the force between them will be one dyne. A unit current is defined as being one of such intensity that, if it is passing through a wire bent into the form of a circle of radius one centimeter, the force due to it on a unit pole at the centre of the circle is 2π, where $\pi = 3.14159$. This unit is called the 'C. G. S. electromagnetic unit;' and it has been shown by experiment that its ratio to the 'C. G. S. electrostatic unit' is 3×10^{10}. A current of intensity 2 around the same circular circuit would produce the force 4π on a unit pole at the centre; and experiments show that if a current of intensity i is passed around a circular circuit of radius r centimeters, the force on a unit pole at the centre is

$$\frac{2\pi i}{r}$$

If there are n turns of wire making up a flat coil of radius r, the force on a unit magnetic pole placed at the centre is

$$\frac{2\pi n i}{r}$$

The 'dimensions' of a magnetic pole are $M^{\frac{1}{2}} L^{\frac{3}{2}} T^{-1} \mu^{\frac{1}{2}}$ (see MAGNETISM); and since the force on a pole of strength m due to an electric current as just described is $\frac{m 2\pi i}{r}$; the dimensions of this fraction must be those of a force, i.e. MLT^{-2}. Since the dimensions of m are given and r is a length, i, the current-strength has the dimensions $M^{\frac{1}{2}} L^{\frac{1}{2}} T^{-1} \mu^{-\frac{1}{2}}$. Therefore, on the C. G. S. electromagnetic system, an electric quantity has the dimensions $M^{\frac{1}{2}} L^{\frac{1}{2}} \mu^{-\frac{1}{2}}$; μ in these expressions represents the dimensions of magnetic permeability, or inductivity, as it is called.

If a small magnetic needle is pivoted at the centre of a coil with its axis in the plane of the coil, there will be a couple (q.v.) acting on the needle tending to make it turn at right angles to the coil. This couple may be balanced against a couple due to the earth's field of magnetic force; and in this manner the current-strength i can be measured in terms of the earth's field of force. Such an instrument is called a 'galvanometer,' because it measures a steady electric current. By means of it Faraday's laws of electrolysis may be verified. The number of grams of any substance liberated each second when a unit current passes through an electrolyte is called the 'electro-chemical equivalent' of that substance. The values of this quantity for some elements is given in the following table:

Hydrogen	0.000104
Oxygen	0.000829
Copper	0.003290
Zinc	0.003385
Silver	0.011180

The number of tubes of magnetic induction (see MAGNETISM) which pass through any coil of wire when it carries a unit electric current is called its 'coefficient of self-induction'; and the number of tubes which pass through a second coil of wire owing to this unit current in the first coil is called the 'coefficient of mutual induction' of the two coils. It may be proved that this same number would pass through the first coil if there were a unit current in the second. These coefficients of self and mutual induction—sometimes called simply 'the induction'—are mathematical functions of the size and shape of the coils, of their relative positions, and of the surrounding medium, but are independent of the currents. If L_1 is the coefficient of self-induction of one coil, and M that of mutual induction between it and a second coil, and if currents of intensities i_1 and i_2, respectively, are flowing in the two coils, the number of tubes of induction through the first coil is $Li_1 + Mi_2$.

If the electro-motive force applied to the terminals of a metal wire are varied, and the corresponding current measured, it is observed that one bears a constant relation to the other. If i is the current strength and E the electro-motive force, $E = Ri$, where R is a constant for the given wire, and is found to vary directly as the length of the wire and inversely as its cross-section, and to be different for different metals or for the same metal at different temperatures. R is called the 'electrical resistance' of the given wire at whose terminals the E. M. F. E. is applied. This law connecting E, R, and i is called 'Ohm's law.'

The heating effect in the conductor has been shown to be Eit; and so this may be written i^2Rt, showing that the effect is the same for a plus as for a minus current, i.e. it is independent of the direction of the current.

MEASUREMENT OF ELECTRICAL QUANTITIES. As already explained, the intensity of an electric current may be measured in terms of the earth's magnetic force by a galvanometer, and the value of this force may be determined by suitable measurements. (See MAGNETISM.) Thus the numerical value of any current on the C. G. S. electromagnetic system may be obtained. (There are other and better methods, depending upon the attraction of two parallel coils of wire carrying currents.) The intensities of two currents may be compared by making them pass through a voltameter (q.v.), and then applying Faraday's first law of electrolysis. To measure the electrical resistance of a conductor the simplest method—at least theoretically—is to measure by means of a calorimetric experiment the heating effect in it produced by passing through it a current whose intensity is measured. The heating effect is i^2Rt; and, as both i and t are easily obtained, R can be calculated. This will be its numerical value on the 'C. G. S. electro-magnetic system.' To compare the electrical resistances of different conductors, the simplest and most accurate method is the use of 'Wheatstone's bridge' (q.v.). If the resistance of a given conductor is known, and if the current produced through it by any E. M. F. can be measured, the numerical value of this E. M. F. is given by Ohm's law. Methods for the comparison of different electromotive forces are described in all text-books on physics and electricity. Owing to the inconvenient magnitude of the units of resistance and of electro-motive force on the C. G. S. electro-magnetic system, other units have been adopted for practical use. (See ELECTRICAL UNITS.)

The 'ampere' (q.v.), or practical unit of current, is one-tenth the C. G. S. electro-magnetic unit; the 'ohm,' or practical unit of resistance, is substantially 10^9 C. G. S. electro-magnetic units; the 'volt,' or practical unit of electro-motive force, is substantially 10^8 C. G. S. electro-magnetic units.

INDUCED ELECTRIC CURRENTS. If the magnetic field inclosed by any conductor, e.g. a wire bent into a closed circle, is *varied* in any way, there will be produced in the conductor an electric current, which continues only while the change goes on. This is called an 'induced current,' and it is said to be due to an induced E. M. F. If there was a current in the conductor originally it will be either increased or decreased, depending upon the direction of the induced current. This last is in such a direction that by its electro-magnetic action it will oppose that change in the magnetic field which produces it. Thus, if the change is due to the approach of a magnet having its north pole foremost, the induced current will be such as to cause the repulsion of the north pole while, if the change is due to the removal of the north pole of the magnet the induced current will be in the opposite direction. The change in the magnetic field may be due, also, to the approach or removal of electric currents, to the change in the intensity of neighboring currents, or to changes in the original current in the conductor itself. Special cases of this last kind are afforded when a conductor carrying a current is broken, and also when the broken parts are reunited, thus again starting the current. In the former case the magnetic field starts at once to decrease; and owing to this there will be an induced current tending to neutralize the change in the magnetic field, i.e. in the same direction as the original current: this is shown by the spark which passes between the ends of the conductor where the circuit is broken. (This 'extra current on breaking' is used often to produce a shock in the muscles of the arms or body; for, by increasing the magnetic field of the original current by winding the wire in a helix, a powerful shock may be felt.) When the circuit is again made, if the current regained its original value at once there would be a sudden increase in the magnetic field; as the field increases, however, there are induced currents tending to oppose the change, and hence the current regains its former value at a rate depending on the self-induction and the electrical resistance of the conductor—a very short time, however, in general is required. In all cases the induced E. M. F. (and therefore the intensity of the induced current) varies directly as the change in the tubes of magnetic induction, and inversely as the time taken in which to accomplish this change. The induced E. M. F. equals the change in the number of tubes of induction in one second. In fact, the simplest way of defining a unit of self or mutual induction—or 'unit induction'—is to say that it is the induction in a circuit when the induced E. M. F. in it has the value one, while the inducing current varies at the rate of one unit per second. For, if M is the coefficient of mutual induction between two coils, and if a current i passes through one, there are Mi tubes through the other; therefore, if the current i varies at the rate of one per second, Mi will vary at the rate of M per second; but the induced E. M. F. equals the rate of variation of Mi, i.e. equals M; so, if the induced E. M. F. is unity, M must equal one. The energy required to produce the current comes from whatever agency changes the magnetic field, except when a current is made or broken, i.e. except cases involving self-induction. On breaking a circuit which carries a current, the cell or other source of E. M. F. ceases to furnish energy; and that required for the 'extra current' comes from the surrounding medium; so this current continues only so long as this supply lasts. This energy of the medium is associated with the magnetic field around the conductor due to the current. Similarly, when a current is 'made' by joining the two ends of the broken conductor, the cell or source of E. M. F. begins to furnish energy; and this is spent in two ways at first, producing the magnetic field, and in overcoming the resistance of the conductor. When the current rises to its full value, as given by Ohm's law, the magnetic field reaches its final value, and all the energy now goes to overcoming the resistance (i^2Rt). This energy of a magnetic field—around either a current or a permanent magnet—is undoubtedly kinetic; the ether and the portions of matter, if they are magnetic, are in motion. Clerk-Maxwell has shown how magnetic actions can be explained if a line of magnetic force is a linear vortex, the ether and the very small portions of matter spinning around this line as an axis, and if these different vortices are made to depend on one another by means of some kind of mechanism connecting them.

The applications of induced currents are almost too numerous to mention: earth inductors to measure the direction and intensity of the earth's magnetic field; induction coils to produce sparks, etc.; transformers as used commercially to reduce or increase the E. M. F. of currents; all forms of dynamos; the telephone; all apparatus that depends upon the use of alternating currents, etc.

ALTERNATING CURRENTS AND ELECTRICAL WAVES ALONG CONDUCTORS. If the E. M. F. impressed upon a conducting circuit is not constant, the current will vary and there will be complications owing to the induced currents. In particular, if the E. M. F. is periodic in the same way that the motion of a pendulum is periodic, i.e. if it rises to a maximum, decreases to zero, becomes negative, reaches a maximum negative value, increases to zero, then to its positive maximum, etc., according to the formula $E = E^0 \cos pt$, the E. M. F. and the current are the simplest cases of 'alternating' electro-motive forces and currents. E^0 is the maximum E. M. F., and the number of times the E. M. F. makes a complete period in one second is $p/2\pi$ (where $\pi = 3.14159$). If the conductor to which this alternating E. M. F. is applied is not too long, the intensity of the current in all parts of it will be the same at any one time; but, if the conductor is many miles long—like an ocean cable, or a telephone or telegraph line over long distances—the E. M. F. and the intensity of the current will vary from point to point in such a way that there is a wave of E. M. F. and of current in the conductor. (These facts are perfectly analogous to the phenomena observed on shaking sidewise periodically one end of a short rope or of a long stretched rope.) The rate of transmission of the electrical waves along the conductor depends upon the properties of the conductor and the surrounding medium; and it can be proved that the rate at which the amplitude of the wave—that is, the maximum value of the current at any one point—decreases owing to absorption of the energy of the waves varies with the wave-length. Long waves, that is those for which p is small, die down more slowly than short waves, for which p is large. It is owing to this fact that long waves travel farther than short ones; and therefore on ocean cables very long electrical waves are used. A discovery made in 1900 by Professor Pupin of Columbia University has shown a method by which a special kind of conductor—one in which coils of wire are introduced at regular distances—will convey all waves (within certain limits) to the same distance, and will convey them much farther than will an ordinary wire or cable.

HALL EFFECT. One of the most important effects of a magnetic field on an electric current is observed when a thin sheet of metal, e.g. gold-foil, is traversed by an electric current and is held between the poles of an electro-magnet. When there is no magnetic field, the current flows through the sheet in a definite manner; and it is possible to find pairs of points on opposite edges of the sheet which have the same potential: this can be done by joining one terminal of a galvanoscope to one edge, and then joining the other terminal to such a point on the other edge that there is no current through the instrument. If now the electro-magnet is made to produce a field of magnetic force perpendicular to the sheet, there will be a steady current through the galvanoscope. If the magnetic field is reversed, so is this current. This effect was first observed by E. H. Hall in 1880, and is called the Hall effect. The action is exactly as if, owing to the magnetic field, the line joining the two points on the two edges, which were at the same potential, was rotated slightly around an axis parallel to the lines of magnetic force. This action varies greatly for different metals, both in direction and amount, and is proportional to the strength of the magnetic field and to the current-strength in the sheet.

FARADAY EFFECT. Faraday observed in 1845 that, if a beam of plane polarized light is passed through a hollow iron rod forming the core of an electro-magnet, the plane of polarization (see LIGHT) is rotated when the current is passed around the helix forming the magnet. The rotation is in the direction of the current in the helix; that is, it obeys the 'right-handed screw law.' The amount of the rotation varies greatly with the material which occupies all or part of the hollow iron core, and is proportional to the intensity of the magnetizing current.

Both the Hall and Faraday effects are evidences of the rotatory action around a magnetic field of force.

BIBLIOGRAPHY. While the bibliography of electricity is extensive, the subject will be found fully treated in the larger text-books of physics. Of the reference books dealing exclusively with electricity and magnetism the following are recommended, and for the convenience of the reader are grouped in three classes:

Mathematical and Advanced Treatises: Clerk Maxwell, *Electricity and Magnetism* (2 vols., London, 1881); Webster, *The Theory of Electricity and Magnetism* (New York, 1897); Thomson, *Notes on Recent Researches in Electricity and Magnetism* (London, 1893).

Elementary Text-Books: Thomson, *Elements of the Mathematical Theory of Electricity and Magnetism* (London, 1895); Gerard, *Electricity and Magnetism* (New York, 1897).

Elementary and Descriptive Works: Perkins, *Outlines of Electricity and Magnetism* (New York, 1896); Thompson, *Elementary Lessons in Electricity and Magnetism* (New York, 1902); Gordon, *Physical Treatise on Electricity and Magnetism* (2 vols., London, 1883); Glazebrook, *Electricity and Magnetism* (Cambridge, Eng., 1903).

ELECTRICITY, ANIMAL. The property in animal tissues, as nerves and muscles, to produce electrical reactions. It is exhibited especially in various rays, eels, etc. (see ELECTRIC FISHES).

ELECTRICITY, MEDICAL USES OF. Three forms of electricity are used in medicine: Static, galvanic, and faradic. Static electricity is obtained from a frictional machine in which glass plates are rapidly revolved against chamois rubbers or horsehair brushes. The electricity is produced in a succession of sparks, which may be received in a Leyden jar, or in the body of a patient, insulated by being placed on a glass-footed chair. Static electricity has but little quantity, but an enormous electro-motive force; the current has high potential and high frequency, but is devoid of appreciable electrolytic effects. Its use in medical practice is to modify and regulate functional processes, including secretion, excretion, sleep, circulation, and nutrition; in inflammatory conditions, neuroses, paralyses, muscular contractions, skin affections, cancer, tuberculosis, diabetes, Bright's disease, etc.

Galvanic electricity is obtained from a galvanic battery, composed of several cells connected in the usual way, the terminal wires being inserted into metal binding posts, to which electrodes are fastened. The elements used are zinc and carbon immersed in a solution of bichromate of potash containing sulphuric acid, and also a salt of mercury. A current-controller, or switch, is so arranged that one, two, three, or more cells may be used at a time, according to the strength of current desired. The electrodes, or terminals, which are applied to the body, are composed of metal disks, covered with sponge, and insulated so as to be grasped by the wooden handles by the physician without drawing off the current. The sponges are wet before applying. Galvanism causes a contraction of the muscle against which the electrode is applied, on application and again on withdrawal. During the interval of application there is a sensation of heat (also of pain if the amperage be great) and of tingling. A sensation of light, a metallic taste, or a buzzing sound is experienced when the current is passed through the retina, the tongue, or the ear respectively. Galvanism is applicable in treating very many conditions and diseases of the nervous system, as well as of the greatest use in diagnosis of disease.

Faradism is obtained from a faradic battery. An important part of this apparatus is a small induction coil consisting of a core of short, straight, soft iron wires, of large diameter, around which is coiled many feet of wire. Through the wire is run an electric current which when interrupted causes an induced current to flow in a second and surrounding coil and turns the iron core into an electro-magnet. Passing through the coil to the spring-support of the vibrator, the current goes thence to the platinum point on the interrupter, and thence back to the cell, completing the circuit. But as the current, in passing through the coil, makes the iron core an electro-magnet, it furnishes the energy that attracts the hammer on the spring-support, which, drawn to the magnet, breaks the circuit in leaving the platinum point of the interrupter; the current then ceases, the iron core loses its magnetism, the spring ceases to be attracted to the iron core, and its tension causes it to return to its former position, in which it touches the platinum point of the interrupter again, and again the circuit is closed. Thus the circuit is made and broken with extreme rapidity and frequency. The secondary coil is insulated from the primary coil and its terminals are connected with the electrodes. The rapid making and breaking of the current in the primary produces an induced current in the secondary which can be regulated at will by the operator. This induced current is applied to the human body by means of electrodes, as in the galvanic battery. The effects of faradism are wholly electrotonic. It is useful in mild cases of spinal and peripheral paralysis. Changes of circulation or of molecular state may be excited in central organs by reflex irritation produced by faradism. General faradism is beneficial in gout and rheumatism, myalgia (muscular rheumatism), in widespread eczema, in constipation due to indigestion, in hypochondria, hysteria, and neurasthenia. Local faradism is beneficial in but few cases which are not ameliorated in larger measure by galvanism. Faradism is useful in testing conditions of muscles; but here, too, galvanism is of greater value. Special electrodes of various shapes are used in applying the current to different parts of the body. A flat oval electrode, about 6 by 4 inches, is useful in applications to the abdomen or spine; a small, pointed electrode, for singling out one muscle of a small area, or testing a nerve; a small oval bean-shaped electrode, fastened to a rubber-covered wire, for swallowing in order to electrify the interior of the stomach; an electrode shaped like a knitting-needle, with all but a half-inch of the tip insulated, for intra-uterine use; a wire brush for special use with the faradic current, etc. An interrupting electrode is so made that with the thumb of the hand that applies the electrode the circuit may be closed and opened at will for testing accurately. A special electrode is arranged for the insertion in its extremity of bibulous paper saturated with a drug in solution, which is carried into the skin, when a current is passed, using this as the cathode. This is called the kataphoric electrode. A galvanic battery is furnished with a device by which the current may be run in different directions by moving a switch, thus altering the polarity of an electrode without moving it. This is especially useful in testing for degeneration in a muscle. Normally the cathodal closure contraction of a muscle is greater than the anodal closure contraction. If degeneration has occurred in a nerve supplied to a muscle the anodal and cathodal closure contractions may be equal, or the anodal may be greater than the cathodal. Faradic contractility is less in muscle supplied by a degenerated nerve than in one in a normal condition. By means of the kataphonic electrode a medicine like iodide of potassium may be used locally in definite quantity, as in a glandular enlargement; or cocaine may be applied over the painful spot in a neuralgia or neuritis, or may be applied to the gum of a sensitive tooth before filling or extraction.

Besides the use of electrization in several diseases, as stated under their own titles, in paragraphs on treatment, galvanization is of immense value in exercising paralyzed muscles, securing their nutrition, and preventing their atrophy until relief of the central condition has been accomplished or regeneration of nerves been secured. In surgery the electrolytic action of the galvanic current is employed in destroying tumors; hypertrophied tissue, as in the nasal cavity; removing nævi and birthmarks, or superfluous hair, etc. The galvanic current is also utilized in heating a cautery for searing a surface or area, to secure a cicatrix; for causing counter-irritation, etc., its utility over the ordinary or Pacquelin's cautery being largely due to the fact that it can be placed in position when cold, and instantly heated to the required degree by passing through it a current of known amperage. For further information, consult Rockwell, *Electricity in Medicine* (New York, 1904); Guilleminot, *Electricity in Medicine* (New York, 1906). See DENTISTRY.

ELECTRIC-LIGHT BUG. See FISHKILLER.

ELECTRIC LIGHTING. Illumination produced by the conversion of electrical energy into light, practically always through the agency of either arc or incandescent lamps. The electrical energy, or electric current, is produced by dynamos (see DYNAMO-ELECTRIC MACHINERY), driven most frequently by either steam-engines or water-power, and sometimes by other forms of mechanical power, such as wind. The dynamos may produce direct or alternating current, of either high or low potential, which is brought to the lamps through a system of wires. The arc light is produced when an electric current passes across a space between two conductors, usually carbon rods, which have been in contact and then slightly separated. (See ELECTRIC ARC.) In the ordinary incandescent lamp an electric current passes through a carbon filament mounted in a glass bulb, from which the air has been exhausted. The carbon filament offers considerable resistance to the current, the energy of which is thus transformed into heat. When the carbon is sufficiently heated it becomes incandescent and emits light.

The arc lamp was the first to be developed, and while its inception dates from the very beginning of the nineteenth century, its general use for lighting was only during the last twenty years of that century and preceded that of the incandescent lamp by only a few years. In 1862 one lamp of this kind was installed in a lighthouse at Dungeness. Supplied with current from a cumbrous Holmes magneto-electric machine, this light was in use for many years, and is credited with being the first electric lamp in regular service. Gramme's dynamo of 1870 marked an era in electrical development, yet there were but two electric-light exhibits at the Centennial Exhibition at Philadelphia in 1876. Only 23 years later the revised list of electric lighting exhibits at the Paris Exposition included 200 entries. In 1878 Paul Jablochkoff's 'electric candle' made a sensation. He placed his two carbons side by side, vertically, with baked kaolin between them, and did away with the carbon feed-mechanism. It was only an ingenious arrangement which did not come into use. In the same year, however, Charles F. Brush, of Cleveland, Ohio, devised a complete system of arc electric lighting, including a special form of dynamo and lamps arranged in series. About the same time the Thomson-Houston system was developed, as well as a number of others.

The Edison incandescent lamp was first exhibited in 1879 in Edison's laboratory, at Menlo Park, N. J., and three years later, at the Pearl Street Edison lighting-station in New York, the first incandescent plant was put in operation. Of the previous attempts at incandescent lamps the most promising was one described in 1845 in a British patent to an American named Starr, who died when only 25 years old. In 1885 or 1886 occurred the first use of a transformer (q.v., also see below). Notable developments of more recent years have been supplying both arc and incandescent lights from the same dynamo and wire system, using the inclosed arc lamp, the employment of rotary converters to change alternating to direct currents, or the reverse, the development of the Nernst lamp, the mercury arc, the various forms of flaming arcs, and the improvements in the filaments of the lamps. These various improvements give great flexibility to the generation, distribution, and use of electric current for light or power.

Central Station is a term used to designate a plant at which electricity is generated to supply many customers, while what are known as *isolated stations* supply the wants of one building or possibly a group of buildings. The central station may be located many miles from the points where the current is utilized. The best known example of the latter is the Niagara Falls plant, from which current is transmitted to Buffalo for electric-lighting and street-railway service, a distance of 27 miles. (See Power Transmission.) The central stations in large American cities contain steam generating plants of enormous capacity, from some of which the current is distributed to substations. The largest electric-lighting central station in the world is the Waterside Station of the New York Edison Company. This station contained, in 1906, eleven 3500 kilowatt, 6600 volt, 3-phase, 25 cycle alternating current engine-driven generators, and three 5000 kilowatt, 6600 volt, 3-phase, 25 cycle alternating current turbo-generators,—a total of 53,500 kilowatt. An addition to this station is in course of building, which, when completed, has been designed to bring the capacity of this station up to the enormous figure of 98,500 kilowatt. Besides the Waterside station, this company operates several smaller stations, aggregating in capacity 16,900 kilowatt. Practically all the energy used is generated in the form of alternating current, transmitted by underground circuits to the substations, where it is transformed to suit the needs of the several districts supplied.

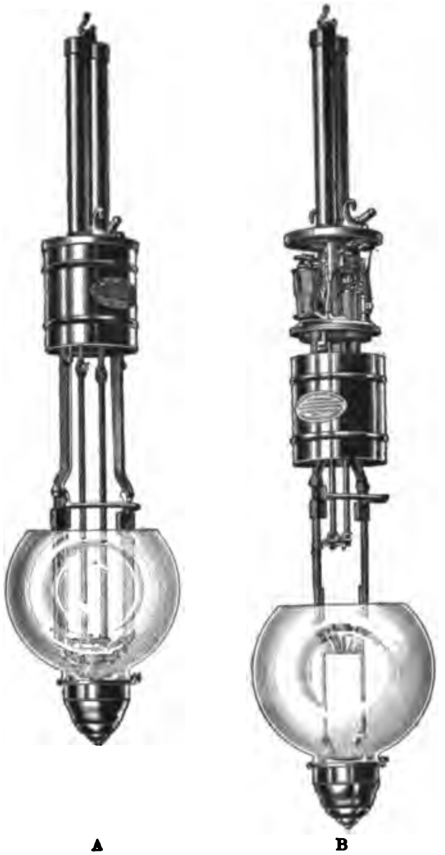
Distributing systems are almost invariably of copper wire, but aluminium is beginning to be employed extensively, though its use depends largely on the relative prices of the two metals. Under certain conditions it may be economical, and it is usually preferable where lightness is essential. Up to the year 1905 aluminium has been employed chiefly for transmission lines, rather than distribution proper. Copper is used on account of its high conductivity. The conductivity of aluminium is only about one-half that of copper, but owing to its lesser density an aluminium conductor weighs only 61 per cent. as much as copper wire of equal length and resistance; on the other hand, the greater cross-section of aluminium wire calls for more insulating material and also for more space, an important consideration in underground work. Wires of either material are most commonly supported on poles, erected along the highways, or less frequently on private land. There is an increasing tendency, however, to place street wires for all classes of electrical service underground. (For a discussion of underground wires, see Cable, Electric, and Subways.) Distributing systems are divided broadly into series, constant-current systems, and parallel constant-potential systems. These may be complicated by various combinations, but only the simplest forms will be described here.

In the *series system* the current passes through each lamp on the circuit in succession and then returns (as is always the case) to the dynamo. The current is generally constant, and of high initial potential, the latter dropping at each lamp as many volts as is lost there by the resistance. Parallel systems employ constant potential, or voltage, but the current varies according to the number of lamps in circuit. The lamps are placed between the two wires of the circuit, the current to each lamp returning directly to the station. Nearly all incandescent and many arc lamps and most electric motors are operated on this system. *Three- and five-wire direct current systems* are designed to save copper. Taking up the three-wire system as the simplest, it may be considered as the combination of two parallel systems into one, by uniting the positive main of one circuit with the negative main of the other. If one of the lamps in a series is extinguished the current for the other returns by the common conductor. The five-wire system is merely an extension of the same principle as the three-wire. Recent improvements in incandescent lamps permit the use of current at 220 volts or more, thus partly doing away with the necessity for the multiple-wire system, but 110 volt lamps are by far the most common.

Transformers (q.v.) are extensively employed to change alternating currents from low to high pressure for transmission through small wires, thus saving great expense for copper. A reversed process turns the current back to any desired low pressure for actual use. To raise or lower the pressure of alternating currents, simple induction coils, or static transformers, are employed. For varying the voltage of a direct current, a motor-generator must be used, while to change an alternating to a direct current, or vice versa, a rotary converter or transformer is employed.

Arc Lamps consist of the carbons, regulating and feeding devices for the carbons and the globes, besides such accessories as automatic cut-outs, so an accident to one lamp will not lead to the extinguishment of others in the series, and lightning arresters, the object of which is evident. In America arc lamps are generally on varying potential circuits, but in Europe they are quite as generally on constant potential circuits.

Ordinary Carbons are made generally from petroleum coke, gas coke, and lampblack being also used. The crude material is crushed, highly heated, ground fine, bolted, in succession, then mixed warm with pitch; the compound is cooled, then reduced to powder, as before. It then may be molded or forced through holes to give the desired cylindrical form. The molded carbons are used principally in constant direct-current series lamps on account of their cheapness. The forced carbons are employed for constant potential or alternating current lamps, where a uniform shape and better material are desired. They may be *cored* by making a hole about ⅛ inch in diameter in their centre and filling it with a special mixture, of less density than the body, to increase the steadiness of the arc. The carbons used for flaming arcs are impregnated or cored with various metallic salt, the vapors of which, rendered luminous by the heat of the arc, give a light of great brilliancy. (See ELECTRIC ARC.) *Copper-plated carbons* are sometimes used for high pressure, constant-current lamps in series, on account of their increased conductivity and long life.

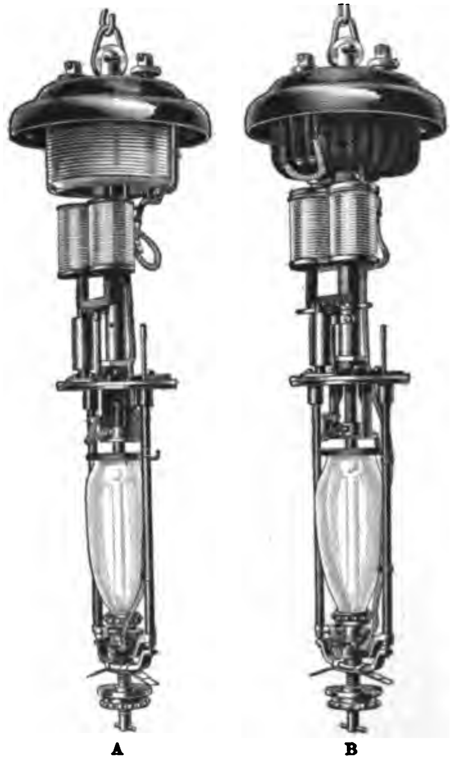


BRUSH ARC LAMP.

A. Ready for use. B. Extended for trimming.

Globes for arc lamps are made of clear, opal, or alabaster glass, and are more regular in thickness and shape when molded than when blown. The best thin clear glass globes transmit 90 to 95 per cent. of light; opal, from 50 to 80 per cent.; alabaster, 40 to 60 per cent. The opal globes diffuse the light and cut off objectionable colors; clear globes are sometimes ground for the same reason. Holophane globes have specially cut outer surfaces, forming a variety of planes and prisms to effect the most perfect diffusion possible, throwing the rays downward.

Regulating Devices are required to feed the carbons so that the arc is maintained constant as the carbon burns away. Open-arc direct-current lamps are generally made with the lower carbon stationary and the upper one to feed downward. The feeding is operated either by a train of wheelwork, electrical or mechanical motors, gravity, or the action of solenoids. When the lamp is not in operation the upper carbon falls and rests upon the lower one; but when the current is passed through them the carbons are separated the required distance by means of an electro-magnet whose coils are traversed by the whole current of the lamp. In order to maintain the carbons the proper distance apart, the upper carbon is held by a clutch or other device whose position is controlled by an electro-magnet. The coils of this electro-magnet are a shunt or branch of the main circuit, of high resistance. When the carbons are at their normal distance apart, the current of the shunt circuit is not of sufficient strength to move the clutch from the position in which it prevents the downward motion of the carbon rod; but when the carbon has sufficiently burned away to increase the resistance of the arc to a determined extent, the increased current which is thereby produced through the shunt circuit is then sufficiently strong to release the clutch and permit the carbon to feed downward. In a well-regulated lamp this feeding occurs so

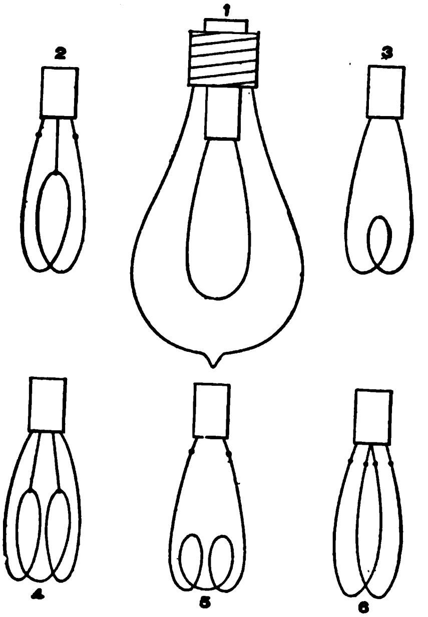


INCLOSED ARC LIGHT.

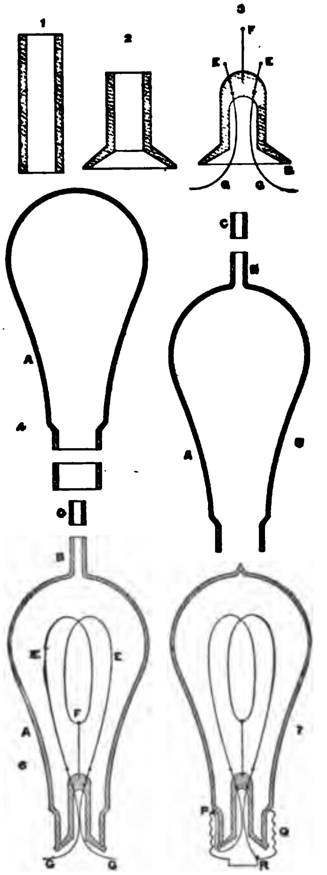
A. Direct current. B. Alternating current.

gradually that it does not affect perceptibly the steadiness of the light. Double carbon lamps increase the time the lamps would burn without renewing the carbons, as one pair of carbons is consumed before the other pair comes into use. As open arc lamps require new carbons every day, they are being replaced by the inclosed type, which burn 100 to 120 hours or more without trimming. In the latter the arc is inclosed in a globe or chamber made as nearly air-tight as possible. When the lamp is lighted the intense heat of the arc expands the air in the chamber and forces out a part of it through a valve, which also prevents the admission of outside air to the chamber. The carbons then burn in a rarefied atmosphere, and the leakage of air is so small that they are oxidized very slowly. Inclosed arcs may be used with both constant and alternating currents. The *flaming arc lamps* are the latest improvement in arc lighting and have a light efficiency far in excess of that of either the open or inclosed arc. The light is also of a much more desirable color, but they require frequent trimming, and, a fact which renders them out of the question for indoor lighting, there is always more or less smoke given off from the arc flame.

INCANDESCENT LAMPS are very simple compared with arc lamps. The carbon strip or filament is bent into the shape of a horseshoe, loop, or some more complex form, and placed inside of a glass bulb called the lamp-chamber. The air is then exhausted from the chamber, most commonly by pumping, after which the chamber is hermetically sealed. The exhaustion of the bulb should be as perfect as possible (see AIR-PUMP), and in order to insure the complete removal of all the air in the bulb, and the occluded gases in the carbon filament, both the bulb and the filament are heated to a high temperature during the latter part of the process of exhaustion. Both the exhaustion and the heating of the lamp must be continued up to the moment that it is sealed. The ends of the filament are attached to platinum wires passing through one end of the glass bulb, and are called leading-in wires. *Filaments* are prepared from numerous substances, such as silk, hair, wood-fibre, cotton, cellulose. The most common practice now is to force a plastic solution of cellulose through a hole, thus forming a thread. The filaments require baking at high temperatures, in order to reduce them to pure carbon, their other constituents being driven off by the heat. In some processes of making filaments no treatment is required after the baking, as the filament is then turned out perfectly even in cross-section throughout its length. Most filaments are not perfectly even in diameter over their whole length, and



FORMS OF FILAMENTS IN INCANDESCENT LAMPS.
1. Single U. 2. Single curl anchored. 3. Single curl. 4. Double curl anchored. 5. Double curl. 6. Double U.



AN INCANDESCENT LAMP IN PROCESS OF MAKING.
1. Thick tube used for base. 2. Second stage of base. 3. Base with platinum wires, G, G, inserted. The filament is joined to the conducting wires at E and E and anchored at F. 4. Bulb, A, blown from a glass tube. 5. A tube, C, is attached to the upper end of the bulb. 6. The bulb with the base fused in. B is connected with an air-pump and the bulb exhausted. 7. The finished lamp, after the bulb has been sealed, and the base inserted in its mounting (Edison form). One terminal connects at P with the metallic threaded end which fits into the socket, thus connecting with one of the main wires. The other connects with a projecting stud at R, which is imbedded in plaster of Paris, and thus insulated from the threaded part. This stud comes in contact with an insulated strip in the mechanism of the socket in connection with one of the wires of the mains.

any unevenness makes either bright or dull spots when lighted. To correct this, the filament is burned for a few moments in a hydrocarbon vapor. The spots which burn brightest on the filament are those of smallest diameter, and they have a higher temperature than the rest of the filament. Now carbon is deposited from the hydrocarbon vapor on to the filament when a certain temperature is reached, and the higher the temperature the faster the deposit. The spots of higher temperature will take on the deposit of carbon faster than the rest of the filament, and in this way the diameter thoughout becomes perfect, even in a few moments. Recently, considerable progress has been made in increasing the efficiency of incandescent lamps by improvement in the manufacture of the carbon filaments, and also by making the filaments of substances other than carbon. The ordinary carbon filament lamp has an efficiency of 3.1 watts per candle-power, and a life of about 500 hours. By properly applying excessively high temperatures to the ordinary carbon filaments during the process of manufacture, an efficiency of 2½ watts per candle-power can be obtained without a decrease in the life of the lamp. The temperature required to produce this change is between 3000 and 4000° C., and the heating must take place at atmospheric pressure. These filaments have been given the name "metalized filaments."

Numerous attempts have been made to employ other metals than carbon for the filaments of incandescent lamps. One of the first successful lamps having a metal filament was the "Osmium Lamp." However, in spite of its very high efficiency and long life, this lamp has only a limited application, on account of its low voltage, and most of all by the limitations of the visible supply of the material of which the filament is composed.

Lamps having filaments of tantalum or tungsten are now made which have a much greater efficiency than even the "Metallized" carbon filament lamp, their only drawback being the considerably higher cost of manufacture.

The Osmin lamp and the Osram lamp have filaments of tungsten, "Osmin" and "Osram" being merely trade names. Tantalum lamps having a life of 500 hours require about 2 watts per candle-power; tungsten lamps having the same life require about 1.25 watts per candle-power.

The helion lamp, for which is claimed an efficiency of 1 watt per candle-power, and a life of 1000 hours, has a filament of carbon coated with a thin layer of silicon. The cost of manufacture slightly exceeds the cost of the ordinary carbon filament lamp. Incandescent lamps are generally connected in multiples—that is, each lamp is connected across the two conductors leading from the poles of the generator. The energy of power consumed in electric lamps, as in the case of other electrical apparatus, is measured in watts, 746 of which are equivalent to a horse-power.

In electric lighting the chief consideration is to obtain the maximum amount of light with the least expenditure of energy. The ordinary open arc lamp requires 450 watts, or a current of 10 amperes of current at 45 volts, while a 16 candle-power incandescent lamp takes ½ ampere at 110 volts, or 55 watts. The actual energy required is increased by losses in the conductors leading to the lamps. Incandescent lamps now range from 1 candle-power or less, if desired, to, say, 100 candle-power or more, and arc lamps from some 350 candle-power, in the case of the closed lamps, to 2000 candle-power. A far higher power is obtained in lamps designed for a special purpose, such as search-lights (q.v.). Incandescent lamps are generally made to operate at voltages of 50 to 60, 100 to 120, and 200 to 250, but special types are constructed with which much lower voltages are employed, such as bicycle lamps, taking ½ ampere of current at 5 volts, and giving ¾ candle-power; and surgical lamps using about 1 ampere of current at 3 volts and giving ½ candle-power. As already stated, the ordinary open-arc direct-current lamp operates at 45 volts, using from 6 to 10 amperes. The inclosed arcs usually run some 50 per cent. higher in voltage.

Candle-Power is a very misleading term, inasmuch as the luminosity varies with the angle at which the light is emitted; in the case of arc lamps it is greatest at an angle of 40° below the horizontal. It is spoken of as mean horizontal and mean spherical, according to the direction of the light-rays, whose average is taken, or else the maximum value is ascertained and used. The mean spherical candle-power is the most, and the mean horizontal is the least, significant; but since the latter is the easiest and the former the hardest to measure, and as they frequently approximate in value, the horizontal is the one most commonly observed. It is usually far better that lighting contracts be based on the energy consumed, which may be readily and automatically measured and recorded, rather than on candle-power, a method which requires frequent photometric measurements to insure a fulfillment of contract. On the other hand, if the lamps, including the globes of arc lamps, are poorly maintained, much of the energy produced may be lost. Candle-power is generally determined by comparing the intensity of the light in question with a standard, by means of a photometer.

The **Nernst Lamp**, invented by Professor Nernst, of Göttingen, employs a small rod or strip of refractory material which is an insulator at ordinary temperatures, but becomes a good conductor and luminant at high temperatures. This is used in place of the carbon filament of the incandescent lamp, and is not inclosed in a vacuum. The medium is a compound of magnesia and rare earths, such as zirconium and thorium oxides, and the lamp may be used with either direct or alternating currents. Some form of heater is required to make the medium conducting when the lamp is first lighted, a temperature of 700° F. being necessary.

Vacuum Tubes for electric lighting give promise of great efficiency, but so far have been employed only to a limited extent, owing to the poor quality of the light produced. In the Cooper-Hewitt lamp an arc is established between two electrodes of mercury, or one electrode may be of iron, in a glass tube from which the air has been exhausted. The passage of current renders the mercury vapor brilliantly luminous, the color of the light, however, being a greenish blue. The absence of red light prohibits the use of this lamp where the color of the objects illumined is of importance, but there is a large field for its application in the lighting of shops, offices, and draughting rooms. Apparatus similar to the mercury vapor lamp has been recently introduced for the purpose of converting alternating into direct current for charging small storage battery outfits. Its operation depends upon the fact that when the mercury arc is once established it will allow the passage of current in one direction only.

Where the area supplied is within a short radius of the generating stations, the direct current is used; but where the area served is large, or where the generating station is remote, as in the case of long-distance transmission, a high-potential alternating current is employed, with step-down transformers to reduce the potential, or rotary converters to change it to direct current. Against the advantages due to the simple generating machinery, and the smaller wires used in the alternating system, there is the cost of transformers and extra precautions and dangers incident to high-potential current. Incandescent lamps are invariably used for domestic and most office lighting, and, in general, where a thoroughly distributed light which is not glaring in its brilliancy at any point is desired. Arc lamps are more commonly employed for street lighting, and are much used in stores and some classes of large assembly halls or rooms. The inclosed arc lamp, the use of arcs of lesser candle-power, and the combination of arc and incandescent lamps on the same circuit, permit a wide range of choice.

BIBLIOGRAPHY. Crocker, *Electric Lighting* (New York, 1904); Houston and Kenelly, *Electric Arc Lighting* (New York, 1902); id., *Electric Incandescent Lighting* (New York, 1902); Bell, *The Art of Illumination* (New York, 1903); Slingo and Brooker, *Electric Engineering for Electric Light Artisans and Students* (London, 1903); Houston, *Electricity in Every-day Life* (3 vols., New York, 1905). See DYNAMO-ELECTRIC MACHINERY; STORAGE BATTERIES; TRANSFORMERS; TRANSMISSION OF POWER; ELECTRIC METER.

ELECTRIC METER. In popular usage, an instrument to measure and record the consumption of electrical energy, called technically a wattmeter. The first commercial meter was the Edison chemical meter, used extensively in the early days of incandescent lighting. In this the current is measured by the amount of chemical action in an electrolytic cell. According to the law of Faraday, the amount of metal deposited on one electrode or dissolved from the other is proportional to the current passing between them. As these meters are always used on constant pressure circuits, their indications are also proportional to the energy supplied over the circuit. Two electrodes of zinc are immersed in a zinc sulphate solution, and arranged as a shunt or branch circuit across a resistance of German silver inserted in the main circuit. The plates are collected and accurately weighed, and the consumption of current ascertained by dividing the loss in weight experienced by one of the plates by 0.000337, the electro-chemical equivalent of zinc, to obtain the amount of current in the branch circuit, and then multiplying by the ratio of the resistance of this branch circuit to the German silver resistance across which it is connected. This meter is quite accurate, as it is possible to compensate for changes in the temperature and make other corrections; but it possesses the disadvantage that it cannot be read by the consumer, while the collection and weighing of the plates is both troublesome and expensive. The recording wattmeter of Prof. Elihu Thomson is in its essentials a small electric motor. It can be used for either direct or alternating current, and has dials similar to those of an ordinary gas-meter, so that it may be read at any time by anyone. The field is connected in series with the circuit being supplied, and the armature is connected across the mains. The motor is so designed that the magnetic field produced is directly proportional to the current flowing through the field windings, which is the current supplied to the circuit, and the armature current depends solely on the pressure between the mains. The force causing the rotation of the armature is therefore directly proportional to the product of the main current and the pressure, *i.e.*, the watts supplied to the circuit. Mounted on the shaft of the armature is a disc of copper or aluminium which revolves between the poles of a permanent magnet. As the armature revolves Foucault, or "eddy," currents are set up in this disc, which retard the motion of the armature and render its speed directly proportional to the driving force. The speed of revolution is therefore directly proportional to the rate at which energy is being consumed in the circuit, and the total number of revolutions gives the energy or kilowatt-hours consumed.

Another direct reading meter based on the motor principle is the Shallenberger meter, used exclusively to measure alternating currents. By using a closed copper coil inside of, and at an angle to, a main coil through which the current passes, a rotating field is produced by the alternating current, which causes a thin disk of metal, fastened to a vertical axis and connecting with the registering mechanism, to revolve. This spindle carries below the disk vanes of aluminium, which tend to retard its speed of rotation and makes the number of revolutions strictly proportional to the current. While the Shallenberger meter records merely current-hours, another instrument of similar form, known as the Westinghouse integrating meter, is provided with a shunt winding where the effect produced depends upon the voltage. This enables watt-hours to be recorded. There are also other instruments based on these same general properties, but differing in details of design. In other forms of meter, clockwork or pendulums are utilized, and an electromagnet, through whose coils the current passes, affects the mechanism so that a record is made of the passing current. The principle that a conductor over which passes a current when placed in a magnetic field will seek to place itself perpendicular to the current and the lines of force has been utilized in the design of the Ferranti meter which is employed in English practice. In this instrument the main current passes through an electro-magnet, between the poles of which there is placed a shallow dish of mercury through which the current also flows, entering at the centre by a metallic pin and passing out through the surrounding rim. The mercury is set into revolution in the passage of the current, and this motion is communicated to a system of dials by means of a vane which dips into the mercury, and suitable spindles and gears. The chamber containing the mercury is so grooved that the friction produced, which is the force that the revolving mercury has to overcome, is proportional to the square of the speed; and, as the driving force varies with the square of the current, the number of revolutions must vary directly as the currents and ampere-hours are recorded.

A meter in practice must be accurate to within 2 or 3 per cent. and be so simple in its construction and operation as to require little care, as it is the usual and commonplace method of ascertaining how much current is actually consumed by the patrons of a power station; and its importance is recognized and improvements are constantly being made in both design and construction. In fact, the increased use of electric lighting has given rise to a form of meter known as the 'prepayment meter,' where the insertion of a coin will so affect the mechanism that the appropriate amount of current is allowed to pass through the mains. For a description of electric meters of all types, consult Croker, *Electric Lighting*, vol. ii. (New York, 1901); Bell, *Electric Transmission of Power* (New York, 1906).

ELECTRIC MOTOR. See DYNAMO-ELECTRIC MACHINERY.

ELECTRIC RAILWAYS. Railways on which the cars or trains are propelled by electric power, either transmitted from central power stations or supplied by accumulators or storage batteries carried on the cars themselves. The first attempt to build an electric railway of which there is any record was made by Thomas Davenport, a blacksmith and wheelwright of Brandon, Vt., in 1835. For a motor he had a revolving electro-magnet running between soft iron armatures or pole-pieces, carrying upon the revolving shaft a commutator by which the direction of the current was regulated. Three years later, Robert Davidson, of Aberdeen, Scotland, built an electric locomotive for standard gauge railway trucks which made several successful trips. In 1850 Prof. C. I. Page, of Washington, D. C., made a 16 horse-power electric locomotive which was tested on the Baltimore and Ohio Railroad, and developed speed as high as 19 miles per hour. About the same time Moses G. Farmer constructed a small model electric railway, which was notable for the fact that a reduction gear from the motor shaft to the driving axle was employed, and because the current was supplied to the motor through the rails. All these early attempts at electric propulsion were made previous to the invention of the dynamo, and current had to be obtained from batteries. In these early attempts it was realized that the expense of generating electricity in chemical batteries was too great to admit of its application to propulsion on railways. With the development of the dynamo, and as one improvement and discovery after another was made, the fact was demonstrated that in its use lay the means of transmitting electrical energy for railway operation. It was not until 1879, however, that what may be called the first working electric railway of full size was constructed. This was an exhibition line 1000 feet long, built at the Berlin International Exposition by Siemens and Halske; the motor was a Siemens dynamo connected by double reduction gearing to the axle of a car capable of carrying 20 passengers. In 1880 Thomas A. Edison and Stephen D. Field, in America, began experimenting, but a contention between them over priority of patents delayed any real results until 1883. Meanwhile Siemens and Halske had constructed a third-rail line in Berlin and an overhead-wire line in Charlottenburg. In 1883 Werner Siemens built a third-rail line six miles long to the Giant's Causeway, in Ireland. Power for operating the dynamo was obtained from a waterfall operating a pair of turbine wheels. In 1883 the Field-Edison controversy was settled by a consolidation of interests, and an exhibition line 1500 feet in length was installed at the Chicago Railway Exhibition, upon which was run an electric locomotive taking current from a third rail, with joints bonded to improve its conductivity. Later in the same year an overhead line was exhibited in Chicago by C. J. Van Depoele, and about the same time Leo Daft built a third-rail line from Saratoga Springs, N. Y., to Mount McGregor. During this time E. H. Bentley and Walter Knight built a conduit line in Cleveland, Ohio, and later one in New York City and one in Boston.

The first practical overhead-trolley line was built in Kansas City in 1884, in which double overhead conductors were used with a trolley-wheel riding on top of the wire. In 1885 Mr. Daft constructed a third-rail line at Baltimore and Mr. Van Depoele installed an overhead-trolley line at Toronto, Ont. The next step made in the development of the electric railway in the United States, and the one which did most to stimulate capitalists and inventors to the active interest which has produced marvelous perfection in electric-railway transportation which we witness to-day, was the contract made by the Union Passenger Railway Company, of Richmond, Va., with Mr. F. J. Sprague, to equip its 13-mile system of street railways for electric traction. On January 1, 1888, there were 13 electric railways with 48 miles of track in operation in the United States and Canada. There followed a period of consolidation of interests among electric-railway builders, and the modern era of electric-railway development was opened. The history of this growth, so far as it is important to outline it, can but be given as the various modern systems of electric traction are taken up for consideration. For this purpose the subject may be divided into: (1) Overhead-trolley railways; (2) conduit railways; (3) storage-battery systems; (4) electric locomotives and heavy-train systems; (5) central station construction and equipment; (6) cars and motors.

OVERHEAD-TROLLEY RAILWAYS. In overhead-trolley lines, the current for operating the cars is taken from a suspended wire conductor by means of an under-running trolley-wheel carried on a trolley-pole extending upward from the car roof. The current passes down the trolley-pole conductor to and through the motor, and returns to the central station by way of the rails. In a few instances double trolley lines have been constructed on which the second conductor provides for the return current. In the three-phase trolley systems, used to some extent in Europe, two overhead conductors are required; for the third con-

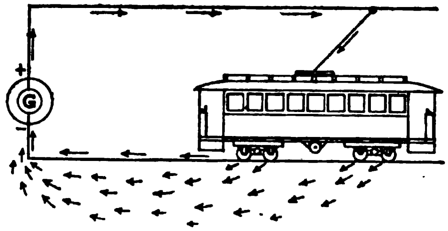
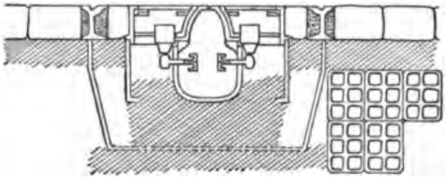


DIAGRAM OF TROLLEY-CAR CIRCUIT.

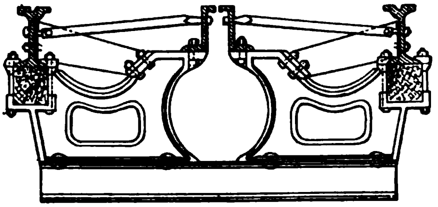
ductor the track rails are used. Trolley-road construction may be subdivided into roadbed and track construction, and overhead construction. Only a few salient features of each can be touched upon here. Street railway tracks when once laid cannot be repaired without taking up the pavement; and as this is an expensive operation, great care is taken in first putting down the tracks. Late practice for city work is to use standard oak ties 6 × 8 inches by 8 feet long, spaced about 18 for every 30 feet of track. A trench is usually excavated for each tie to a depth of from four inches to six inches below the bottom of the tie. The bottom of this trench is filled with broken stone and the tie laid upon this filling. The rails are then laid usually either 30 or 60 feet long, and are connected structurally either by splice plates or cast joints, or by electric welding, and, electrically, where splice joints are used, by means of various forms of rail-bonds. Splice joints for electric railways resemble those of steam railways, and consist of two splice plates for each joint, which are placed on opposite sides of the two abutting rails and clamped together by bolts passing through both splices and rails. The method of making cast welded joints is as follows: The rails at the joint are cleaned and brightened by a sand-blast (q.v.), and a cast-iron mold is placed around the rail-ends, making a tight fit. Into the mold the molten metal is poured. The metal in contact with the mold begins to cool and forms a crust, while the interior remains in a molten state. This crust continues to cool and at the same time contracts, forcing the molten metal toward the centre of the joint. The top or bearing surface is afterwards filed off perfectly smooth, so that it is difficult to detect a joint by riding over it. Electric welding of rail-joints is described in the article on Welding. The rails being laid and the jointing and bonding finished, the space between the ties is ballasted and the pavement laid, restoring the street to its original condition. For suburban and interurban roads, a track built of from 60-pound to 100-pound T-rails spiked directly to the ties is used, the road surface being restored after all is completed.

Overhead construction for trolley roads comprises the electric conductor and the structures for carrying the conductor. The supporting structure for the conductor is of two forms, usually called span-wire and bracket-arm. In the first the trolley-wire is hung from a span-wire stretched between poles on opposite sides of the track; in the second, a single row of poles is used with a bracket-arm extending out over the track to carry the conductor. Often double-bracket poles placed between the tracks carry the two conductors for double-track roads. Both wood and iron poles are used. In America the development of overhead construction has been in the direction of securing lightness, strength, and effectiveness at low cost, and ornamentation has not been sought. In Great Britain and Continental Europe, however, fancy brackets, scrolls, and ornamental castings have been used very generally, and this is the essential difference between the practice on the two sides of the ocean. Car and central station construction are described in succeeding paragraphs.

Conduit Electric Railways. Conduit electric railways are those having some form of conduit or trough below the level of the rails, either between them or at the side of the track. Usually there is a continuous opening or slot in the street, through which the "plow" projects from the bottom or side of the car. In the conduit, supported upon suitable insulators, pins, or brackets, are the conductors, against which suitable rollers or rubbing blocks, forming part of the plow, are pressed. In this way current can be taken from one conductor up through the slot on a wire imbedded in the plow, through the motor, and again back to the other conductor. Various other kinds of conduit systems have been devised, but the one described is the only one which has reached any commercial success. The conduit electric railways of New York and Washington have the conduit between the rails; the only side-conduit railway of importance is that at Budapest, Hungary. As constructed in America, a trench about 2 feet deep at the centre and 6 feet wide is dug along the line of the road, and heavy cast-iron yokes, weighing from 400 to 500 pounds, are placed crosswise of this trench about every 4 feet. To these yokes are bolted the tracks and the rails forming the edges of the slot. Between these yokes and around them is placed concrete, with a trough in the centre to form the conduit.



CROSS-SECTION OF CONDUIT OF ELECTRIC RAILWAY, SHOWING THE METHOD OF SUPPORTING THE CONDUCTOR RAILS.



CROSS-SECTION, SHOWING FORM OF YOKE AND TRACK CONSTRUCTION.

Between and at the sides of the tracks at intervals of about 15 feet small covered openings are made into the conduit, and at these points heavy cast-iron and porcelain insulators are bolted to the slot-rails. These have pins projecting down into the conduit, to which steel T-rails are bolted. The car-plows extend through the slot and have rubbing-blocks which press against the conductor rails. Current is supplied to these conductors by feeders or cables which run in underground conduits alongside the track from the power station, and are attached at intervals to the conductor rails. Drainage is secured by frequent outlets from the conduits to sewers, and manholes at intervals give access to the conduit for repairs. Conduit railways are far more expensive to construct than overhead-trolley lines, chiefly because of the elaborate track and conduit construction required, and because of the necessity of removing underground pipes which interfere with the conduit. The most notable conduit electric railway systems of the United States are those of New York City and of Washington, D. C., the New York system aggregating over 200 miles of line in 1900.

THIRD RAIL SYSTEM. In this system, the current is conducted to the cars by means of a third rail, placed on insulators about 20 inches from the track rails. For this purpose an ordinary T-rail is used, with the joints carefully bonded. This rail is connected at convenient points with the feeders from the generating station or transformer stations. This system is used on all the elevated roads in the United States and also on many interurban roads. Current is taken from the rail by sliding iron contacts called "shoes" mounted on the car or locomotive. The amount of current that can be taken from a third rail through a single contact is much greater than can be taken from the overhead trolley,—hence the extensive use of this system on heavy traction roads.

STORAGE-BATTERY SYSTEMS. Numerous attempts were made in the early days of the art to operate electric railway cars by means of storage batteries carried in them, but none of these attempts met with commercial success. Perhaps the most notable experiment of several made with storage-battery traction in the United States was that carried out on the Fourth Avenue Railway in New York City in 1890. Fourteen cars were equipped with 110 cells each, 55 on each side of the car, under the seats, and were run between the post-office and the charging station at Eighty-sixth Street, about five miles. The result of these experiments led the officers of the road to conclude the system impracticable, owing to the great cost of depreciation of the batteries. Storage batteries, however, find a very important use as regulators in connection with the trolley or third-rail systems of propulsion, being installed in the generating station or substation of the system to prevent heavy fluctuations of load on the generators. Such batteries have been installed on a large scale on some of the largest street-railway systems of the United States, notably the Metropolitan Traction Company's conduit lines in New York City and the South Side Elevated Railway in Chicago, Ill. The New York Central Railroad contemplates the installation of storage batteries for its electric system aggregating in capacity over 20,000 kilowatts.

CARS AND MOTORS. One or more electric motors geared to the car-axles and a controlling switch on each platform constitute the principal parts of a motor-car equipment. Instead of having the journal-boxes attached to the car-frame, as in horse-cars, the motors and running gear are attached to a car-truck, on which the car-body rests. The remarkable improvement which has been made in the design of street-car motors within the last fifteen years is the principal cause of the success of electric railways. The first car motors were entirely too light mechanically and of too small capacity. From a single fifteen-horse-power motor driving one car-axle, the capacity of the car equipments has been gradually increased up to the present practice of using two twenty-horse-power motors, one geared to either axle for ordinary urban service; for interurban service motors as high as 200 horse-power are used. A marked improvement has also been made in the reduction of armature speeds, so that the use of a double reduction in speed by means of a countershaft and two pairs of gears between the armature shaft and the car-axle is now obsolete. Gearless motors, in which the armature is built on the car-axle, have been introduced, but single reduction motors having the armature shaft geared directly to the car-axle are the most commonly used at present. Almost all modern car motors are of the multipolar type instead of the bipolar, as formerly, and the reduction in armature speeds is due to this change of design. The severe service to which street-car motors are subject has led to making them very substantial in design, in order to avoid mechanical injury, and so-called iron-clad motors, in which the field-magnets form a closed iron box, are almost exclusively used to prevent short-circuiting by water, or by nails or scraps of iron picked up by the magnets. Most of the single-reduction four-pole motors are supported on one side on the car-axles by journals set in projecting lugs at each end of the motor frame, the armature shafts being parallel to the car-axles. The opposite sides of the motors are connected to the frame of the car-truck by means of springs, and a pinion on each armature shaft meshes with a gear-wheel on either axle. The function of the springs is to avoid a shock on starting the car, by permitting the motors to turn through a small arc about the axles. In gearless motors the armature shaft is a hollow tube, through which the car-axle passes, and to which it is flexibly connected by means of springs. A number of attempts have been made from time to time to connect the armature shaft and the axle by belts, sprocket chains, friction clutches, etc., none of which has been able to stand the service. The latest improvement in street-car motors is the development of the alternating current single-phase motor. See DYNAMO-ELECTRIC MACHINERY.

CONTROLLING SYSTEMS. The starting and regulation of speed of a single car is effected by means of the controlling switches on the car platforms. The methods of regulation of the different electric railway systems are too numerous to be described in detail, but the same general plan is common to them all. With the direct current system series motors are always used, and the field-windings are wound in a number of separate sections, the ends of which are carried to contact pieces in the controlling switches. In addition to the resistance of the field-winding, a resistance box is also used. The contact pieces in the controller press against corresponding rows of metal plates, each row having its plate connected so as to vary the connections of the wires from the motor. In starting the car, the resistance box, sections of the field-coils, and armature are all in series to prevent a too large passage of current through the armature. The next turn of the switch cuts out more or less of the resistance-box circuit, allowing more current to pass, and by successive movements of the switch, the field-coils pass through various combinations, from all in series to all in multiple, the latter corresponding to the highest car speed. To stop the car, the switch is reversed, making the same combinations in reverse order. To change the direction of the car, a separate switch is generally provided, which changes the direction of the current through the armature with reference to its direction through the fields. Where there is no commutation of the field-coils, the changes in speed depend entirely upon the variable amounts of extra resistance thrown into the circuit.

Multiple Unit Control. In operating trains of several cars at high speed, and yet making many stops, as on the elevated roads in New York and Chicago and the New York Subway, at least every other car of the train is equipped with motors, and the several motor-car equipments are operated simultaneously. This is accomplished by the so-called multiple unit system of control, invented by F. J. Sprague. There are a number of systems of this sort in use, but all embody the same general principles. On each motor-car is a controller of some kind which controls the current flowing to the motors on that car. This controller is operated from a distance by means of electromagnetic or electropneumatic devices controlled by circuits called pilot circuits, which circuits are connected to a master controller operated by the motorman. All the pilot circuits on all the cars are connected to form a "train line"; cars not equipped with motors must nevertheless be equipped with this line and the necessary cable couplers, so as to complete the line throughout the entire length of the train. This train line is connected to all the motor controllers or "contactors" on the train, and to a master controller on each car, so that all the motors on the train can be operated from any car.

Electric Locomotives. An electric locomotive resembles the steam locomotive, with such modications as are permissible with electric motors, and is subject to the same limitations as the steam locomotive, in which there are concentrated in a simple unit the weight and power necessary to handle the trains. In the Heilmann locomotive the trucks carried boiler, engines, dynamo, and motors—an electric-power plant on wheels—and the question of transmission was entirely eliminated. Only one locomotive of this type was ever constructed, as it did not prove a commercial success. The New York Central locomotive is equipped with four 550 horse-power direct-current motors, with their armatures mounted directly on the axles, and is designed to operate on a third rail system. The total weight of the locomotive is 95 tons, total length 27 feet. There are four pairs of driving wheels, the weight on each wheel being 17,000 pounds. All the accessories of a steam locomotive are provided, namely, air compressors for brakes, whistle, bell, heaters, and pneumatic sanding device, all of which are operated electrically. The specifications call for a machine capable of hauling a train weighing 435 tons 34 miles in 44 minutes without stop, and with one-hour lay-over to keep this service up continuously. With a light train this locomotive can make a speed of 70 miles per hour.

The New York, New Haven and Hartford locomotive differs radically from the New York Central type. This machine is designed to operate with either alternating or direct current, and is provided with suitable devices for taking current from either an overhead trolley or third rail. There are four motors, rated at 250 horse-power each, with a continuous capacity of over 200 horse-power. The armature of the motor is not mounted directly on the axle of the truck, as in the New York Central machine, but is mounted on a quill which passes over the axle with an all-around clearance of ⅝ of an inch. On this quill the bearings of the field are mounted, and the flanges on the ends of the quill are connected through a peculiarly designed spring to the driving wheels. The locomotive is 36 feet 4 inches long and weighs about 85 tons. A 250-ton train can be handled on a through service with a speed of 60 miles per hour.

Central-Station Equipment. Generally, the power station should be located, if possible, about the centre of the line, and sufficient power should always be installed to have ample reserve in case of necessity. The size of the power station depends upon the number and size of the cars to be run and the grades to be surmounted. Under ordinary conditions of urban service the amount of power installed in a power station should not be less than 40 horse-power per car for roads operating ten cars or less. Large urban roads find that an installation of 20 horse-power per car is usually sufficient for all purposes.

Consult: Dawson, *Engineering and Electric Traction Pocket Book* (London, 1901); Bell, *Power Distribution for Electric Railroads* (New York, 1900); Hanchett, *Modern Electric Railway Motors* (New York, 1900); Herrick, *Practical Electric Railway Handbook* (New York, 1901); Ashe and Keiley, *Electric Railways* (New York, 1905). For descriptions of the generators used in power-houses, see Dynamo-Electric Machinery.

ELECTRIC TELEGRAPH. See Telegraph.

ELECTRIC WAVES. See Electricity.

ELECTRIC WELDING. See Welding.

ELEC′TRIDES (Lat., from Gk. *Ἠλεκτρίδες*, *Elektrides*, from *ἤλεκτρον*, *ēlektron*, amber). The Amber Islands of Greek mythology, situated at the mouth of the Eridanus, a large river which was identified with the Po, because amber was found at the mouth of the latter. The name was applied also to islands on the northern coast of Europe.

ELECTRO-BALLISTIC MACHINES. See Ballistics.

ELECTRO-BALLISTICS. See Ballistics.

ELECTRO-CHEMISTRY, General. The branch of general chemistry that deals with chemical changes producing, or caused by, electrical energy. The growing industrial applications of electro-chemistry are rendering the science itself more and more important every year. Another title of electro-chemistry to general interest consists in the fact that the phenomena it deals with have long formed a bond between two great branches of human knowledge—physics and chemistry—the science of the various forms of energy and the science of the various kinds of matter. The bond may become even more intimate if the comparatively recent hypothesis, according to which electricity itself is a subtle form of matter, turns out to be in agreement with facts. This hypothesis is briefly as follows: Electricity consists of two chemical elements whose atoms, termed 'electrons,' have exceedingly small (perhaps zero) relative weights; the atoms of positive electricity, or 'positive electrons,' may be denoted by the symbol $\oplus$; the atoms of negative electricity, or 'negative electrons,' may be denoted by the symbol $\ominus$; like the atoms of hydrogen, electrons of either kind are univalent; so that, for instance, an atom of hydrogen when in the ionic state (i.e. when charged with electricity) is combined with a single positive electron, forming the compound $H\oplus$, while an atom of oxygen in that state forms the compound $\ominus O \ominus$ (just as water is HOH). When not thus combined with the atoms of other elements, electrons may possibly form neutral molecules $\oplus \ominus$. The substance made up of such molecules may have appreciably no weight, may be a non-conductor, and may be capable of electric polarization; and it is worthy of notice that these are precisely the properties attributed to the luminiferous ether. While this hypothesis renders Faraday's law (see ELECTRICITY) a special case of Dalton's law of multiple proportions, and may certainly be helpful in fixing on the mind a somewhat definite image of the mechanism of electrical processes, it can hardly be said yet to rest on a sufficient foundation. Whether it should be accepted or not, will have to be decided on the principle expressed, some years ago, by Poincaré: "It is nonsense to ask of a theory, 'Is it true or false?' The question can only be, 'Is it fruitful or not?'"

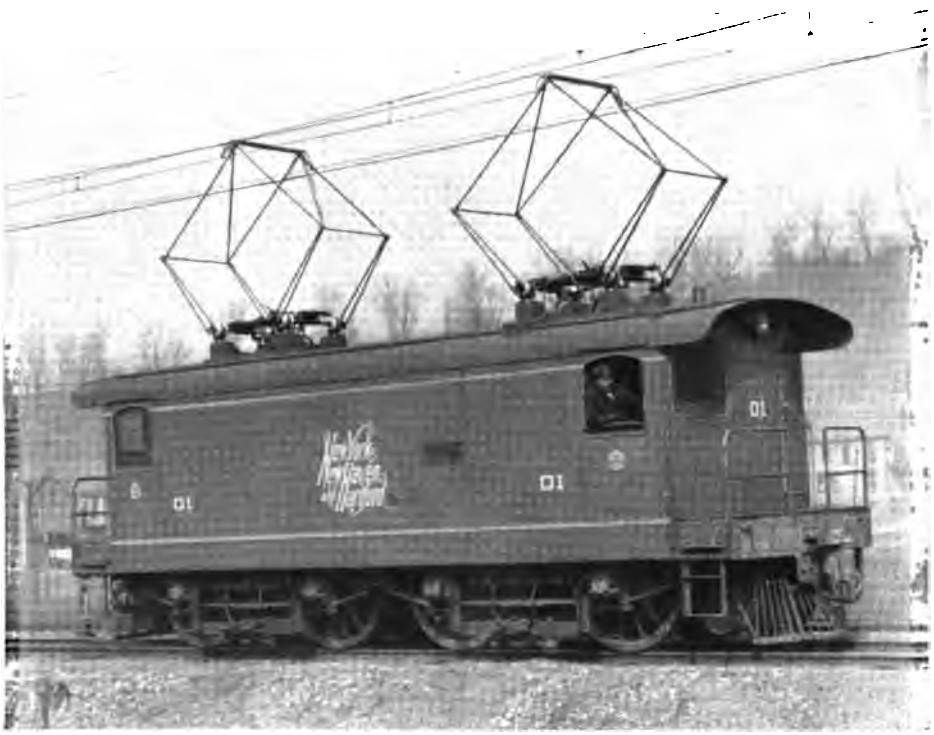
At any rate, the electron hypothesis must not be allowed to confuse our conception of *electrical energy* and its relations to other forms of energy. The term energy, when properly used, designates the cause of any change that is actually taking place, or that is capable of taking place, in a given system. Thus we may speak of the energy of a falling body, and even of a body suspended at a certain height from the earth's surface; for such a body, if released, *would* fall to the earth. Similarly, we may speak of 'electrical energy' whenever a transport of electricity from one point to another is possible in a given system. Energy of every known form can be resolved into two factors—a 'capacity factor' and an 'intensity factor.' In the case of electrical energy, the capacity factor is generally known as 'quantity of electricity,' the intensity factor as 'potential-difference.' Just as in the case of a suspended body the amount of gravitation energy is the greater, the greater the mass of the body and the greater the difference of level between the body and the earth's surface, so in the case of a possible flow of electricity, the amount of electrical energy is the greater, the greater the quantity of electricity and the greater the difference of potential between the two given points. Whatever be the ultimate nature of a mass of matter, gravitation energy is still a form of energy. Similarly, whatever be the ultimate nature of a quantity of electricity—whether electricity be a kind of matter or not—electrical energy is still a form of energy, capable of being transformed into kinetic energy, chemical energy, etc.

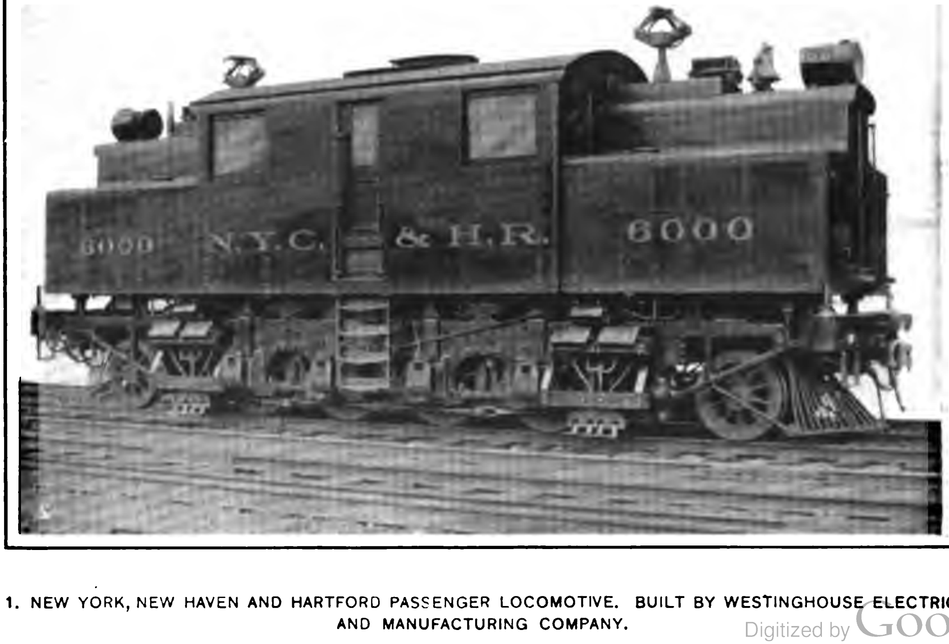
ELECTRO-CHEMICAL REACTIONS. A system in which chemical energy is transformed into electrical is termed a galvanic or voltaic cell, and a combination of two or more cells is termed a galvanic or voltaic battery. One of the first questions that naturally suggest themselves to the student of electro-chemistry is, What are the characteristics of those chemical changes whose energy may assume the electrical form? In other words, What chemical reactions can be utilized for the construction of voltaic cells? The answer is, *All changes, and only such changes, in which acids, bases, or salts, take part, or may be caused to take part, can be employed electro-chemically.* Substances of these classes are termed 'electrolytes,' and they are usually employed, in cells, in the form of aqueous solutions, in which their molecules are assumed to be dissociated into fragments, termed 'ions' (see DISSOCIATION), that are charged with either positive or negative electricity. In most cells the chemical action consists, on the one hand, in the solution of one of the metallic electrodes, its particles entering the solution in the forms of ions; and on the other hand, in the deposition upon the other electrode of another metal, whose particles formed the ions of the solution. For example, the Daniell cell consists, on the one hand, of a zinc electrode immersed in a solution of zinc sulphate, and on the other hand, of a copper electrode immersed in a solution of copper sulphate, the two solutions being in contact, and the two metals being connected by a metal wire; the chemical action of the cell consists, on the one hand, in the entrance of zinc into the solutions in the form of zinc ions, and on the other hand, in the deposition, on the copper electrode, of copper ions in the state of metallic copper. The two simultaneous changes evidently ensue in the system at two separate points connected with one another by a suitable conductor of electricity. This 'chemical action at a distance' is an essential characteristic of electro-chemical action. If in the Daniell cell the two chemical changes took place at points in immediate contact with each other (e.g. if zinc were caused to replace copper by being simply placed in a solution of copper sulphate), a certain amount of heat, but no electricity, would be produced.

An excellent example of changes in which electrolytes may and may not take part is presented by the mere flow of hydrogen or oxygen gas, at constant temperature, from places of higher to places of lower pressure. If, say, hydrogen gas is contained in two separate vessels under unequal pressures, a flow of gas will naturally take place from one vessel into the other, if communication is established between them. But the equalization of pressures can also be caused to take place as follows: let two bars of platinum coated with 'platinum black' (finely divided platinum, which has a great capacity for occluding gases) be half immersed in dilute solution of sulphuric acid, while the other halves are exposed to hydrogen gas contained in two vessels, under two different pressures; on connecting the platinum bars outside the solution by a metal wire, it will be found that a current of electricity passes through the latter, while hydrogen passes through the solution until the pressures in the two vessels have been equalized. The action thus taking place is as follows: in dilute aqueous solution, the molecules of sulphuric acid are broken up into electro-positive hydrogen ions $\overset{+}{H}$ and electro-negative ions $\overset{=}{SO_4}$; neutral hydrogen molecules from the vessel of greater pressure enter the solution in the form of hydrogen ions, and, replacing the free hydrogen ions of the acid, drive them from the solution in the form of neutral molecules into the vessel of lower pressure. Evidently here, too, as in the case of any other voltaic cell, the electric current is caused by ions taking part in the change.

ELECTRO-MOTIVE FORCE. We can now discuss the question as to what determines the electromotive force of a voltaic cell, i.e. the difference of potential existing between its two electrodes. It was once believed that a considerable differ-

ELECTRIC LOCOMOTIVES



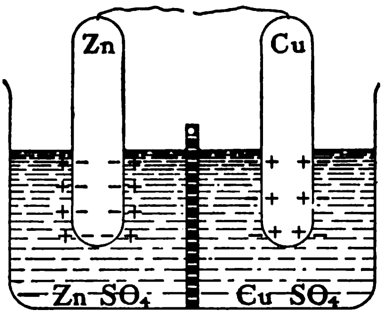


1. NEW YORK, NEW HAVEN AND HARTFORD PASSENGER LOCOMOTIVE. BUILT BY WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.
2. NINETY-FIVE TON NEW YORK CENTRAL R. R. LOCOMOTIVE. BUILT BY GENERAL ELECTRIC COMPANY.

ence of potential is established whenever two different metals are placed in contact with each other; but this is now positively known to be wrong. If differences of potential arise from the communication of the electrodes outside the solution, those differences are certainly very small and need not be taken into account. In the case of cells with two different solutions (like the Daniell cell), a difference of potential is known to exist at the surface of contact of the two solutions; but this, too, is very slight and need not be considered here. The only possible seats of the main difference of potential in a cell are, therefore, the surfaces of contact between the metallic electrodes and the electrolyte solutions—i.e. at the places where ions form and disappear. But how are differences of potential established there? A clear answer to this question is furnished by modern electro-chemical theory. If a liquid is placed in a closed vessel, its vapor gradually attains a maximum pressure which balances the vapor-tension of the liquid at the given temperature. Again, if an excess of sugar is placed in some water, the sugar dissolves, or, so to speak, vaporizes into the water, and the portion dissolved gradually attains a maximum 'osmotic pressure' which balances the 'solution-tension' of sugar at the given temperature. Similarly, if a metal is brought in contact with water, its ultimate particles tend to rush into the volume of the water until a maximum osmotic pressure has been attained. Since, according to the theory of electrolytic dissociation, the free particles of a metal in solution are invariably charged with positive electricity, the osmotic pressure of a metal in solution can evidently be exerted only by its electro-positive ions. Supposing, now, that a bar of some metal is placed in a solution of *one of its salts*, and remembering that the salt is dissociated into metallic and acidic ions, we readily distinguish three possible cases, viz. the osmotic pressure of the metallic ions may happen to be greater than, less than, or equal to the maximum osmotic pressure that would balance the 'electrolytic solution-tension' of the metal.

In the first of these cases, some ions will tend to precipitate themselves upon the metal bar, just as some of the vapor of a liquid would tend to condense, if its pressure exceeded the vapor-tension of the liquid; and the force driving the ions out of solution will evidently be the excess of their osmotic pressure over the solution-tension of the metal. As soon, however, as a single ion is precipitated out, the metal bar is rendered electro-positive, while the solution is rendered electro-negative by the newly created excess of electro-negative ions; for before the immersion of the metal bar the electro-positive and electro-negative ions in solution are precisely equivalent. (See DISSOCIATION.) But this means that a difference of potential will have been created between the metal bar and the solution. Henceforward, every electro-positive ion driven toward the metal bar by the excessive osmotic pressure will encounter a double force driving it back into solution, viz. the electrostatic repulsion of the positive bar and the electrostatic attraction of the negative solution. Finally, when a certain number of ions have been precipitated out, the double electrostatic counter-force will have become equal to the excess of osmotic pressure, and then, equilibrium ensuing, the maximum difference of potential possible under the given conditions will have been established between the metal bar and the solution. This will obviously be the greater, the greater the osmotic pressure (i.e. the concentration of ions in the solution), and the less the specific solution-tension of the metal. Passing now to the second of three possible cases, viz. the case in which the osmotic pressure of the metallic ions is less than the specific solution-tension of the metal, we see that in this case molecules of the metal will enter the solution in the form of positive ions, rendering the solution electro-positive and leaving the metal bar electro-negative. In this case, too, an electrostatic counter-force will then come into play, and the difference of potential at the surface of contact will be maximum when this force has become equal to the difference between the solution-tension of the metal and the osmotic pressure of ions in the solution. The difference of potential will obviously be the greater, the greater the solution-tension of the metal and the less the osmotic pressure of its ions in the solution. Finally, in the third case, viz. the case in which the osmotic pressure of the metallic ions exactly equals the solution-tension of the metal, neither metal will dissolve nor ions precipitate, and consequently no difference of potential will exist at the surface of contact of the metal and the solution.

The principles just developed permit of gaining a clear insight into the mechanism of electro-chemical action. Take, for instance, again the Daniell cell, which consists, as we have seen, of a concentrated solution of zinc sulphate and a concentrated solution of copper sulphate, separated from each other by a porous partition, with a bar of metallic zinc in the former solution and a bar of metallic copper in the latter (see Fig.).



DANIELL CELL.

It will be seen in a later section of this article that the solution-tension of zinc is very great, that of copper very small. Some zinc will therefore enter the solution in the state of positive ions, which will render the zinc solution electro-positive and leave the zinc bar electro-negative. On the other hand, a number of copper ions will join the copper bar in the state of metallic copper, rendering the bar electro-positive and leaving the copper sulphate solution electro-negative. Equilibrium will ensue when the excess of solution-tension in the case of zinc and the excess of osmotic pressure in the case of copper are exactly counterbalanced by the electrostatic forces as explained above. Now, if we should then connect the two bars by means of a metal wire, a flow of electricity (positive electricity from copper to zinc, negative from zinc to copper) would take place between the two bars, and thus the equilibrium would be destroyed. Freed from the electrostatic attraction, the excessive zinc ions of the zinc sulphate solution would migrate toward the excessive negative ions of the copper sulphate solution. At the same time, more zinc, driven by the unchecked solution-tension, would go into solution, and more copper ions, driven by the unchecked osmotic pressure, would be precipitated upon the copper bar. If we should break the connection between the bars, the former equilibrium would soon be re-established, and chemical action would cease. But as long as the connection exists, zinc goes into solution, copper is precipitated, and a current of electricity passes through the connecting wire; we say, "electro-chemical action is going on."

Suppose now that the copper sulphate solution of the Daniell cell was replaced by a solution which could take up molecules from the copper bar, but in which those molecules, instead of being transformed into ions, would form a practically undissociated compound with some other ingredient present. The osmotic pressure of copper ions would thus be extremely slight and might be exceeded by the electrolytic solution-tension of copper, in spite of the latter being comparatively small. It is, therefore, easy to see that under certain conditions it might be possible to reverse the electro-chemical process of the cell. As a matter of fact, this is precisely what happens when the copper bar of a Daniell cell is immersed into a concentrated solution of the cyanide of potassium. On closing the circuit, copper then goes into solution, zinc is precipitated, and the direction of the current is reversed. This and similar phenomena were formerly described as 'anomalous,' because they seemed to contradict the assumption that zinc has a greater 'affinity' for acids than copper. Substituting the definite concept 'solution-tension' for the vague concept 'affinity,' and adding the factor of the 'osmotic pressure of ions,' we experience no difficulty in understanding effects like the reversion of current in the Daniell cell by potassium cyanide, and many other phenomena. And it must be observed that the osmotic pressure of ions is a measurable quantity (see SOLUTION; DISSOCIATION), and that the solution-tension of metals, too, has now been calculated from directly measurable quantities (see further below).

Closely allied to the electro-chemical action of voltaic cells is the immediate precipitation of one metal by another. The precipitation of copper by iron from solutions of copper salts, and the precipitation of finely divided ('molecular') silver by zinc, are familiar examples of this phenomenon, the cause of which is almost self-evident in the light of our theory. When a bar of iron, for example, is immersed in a solution of copper sulphate, the solution-tension of the iron causes the appearance of some iron ions, and hence the formation of an excess of positive over negative electricity in the solution; the electrostatic repulsion between the different metallic ions then tends to drive both iron ions and copper ions out of solution; but the solution-tension of iron is very great, and so the iron ions remain in solution; on the other hand, the slight solution-tension of copper is readily overcome by the force of electrostatic repulsion, and so copper ions are driven out and appear in the state of metallic copper. An analogous exchange takes place when a metal dissolves in an aqueous solution of some acid, the solution-tension of hydrogen being overcome by the electrostatic repulsion between the ions of hydrogen and those of the metal. Only here the external pressure of hydrogen gas comes into play; for the solution-tension of a gas naturally depends upon its pressure. We have seen above that a voltaic cell may be obtained by using a dilute acid and two quantities of hydrogen gas under different pressures: the two quantities of hydrogen act like two different metals because, owing to difference of pressure, their solution-tensions are different. Further, we see that while for certain pressures of hydrogen the solution-tension of a given metal may be greater, for other pressures of hydrogen the solution-tension of the metal may, on the contrary, be less, than the solution-tension of hydrogen. In other words, if we should place in a vessel filled with hydrogen under sufficient pressure the solution of some metallic salt, the metal might be precipitated out of the hydrogen. As a matter of fact, this curious phenomenon has been observed in the case of several metals. If in a vessel containing hydrogen under a pressure of 18 atmospheres (270 pounds per square inch), metallic zinc is brought into contact with a solution containing per liter 12¾ grams of sulphuric acid and 210 grams of zinc sulphate, no action takes place. If the pressure is slightly diminished, zinc goes into solution and hydrogen is evolved. If, on the contrary, the pressure is somewhat increased, hydrogen goes into solution and zinc is precipitated. That the concentration of hydrogen gas (i.e. the amount compressed within unit volume) plays the determining rôle in this phenomenon is clearly evident; and so this and similar phenomena, too, go to show the inadequacy of older chemical theory, which recognized (in a vague qualitative way) only the 'affinity' factor; and, leaving out of account the factor of concentration, 'explained' the dissolution of metals in acids by the assumption that metals have greater affinity for acid radicles than hydrogen.

ELECTRO-CHEMICAL SERIES. The potential-differences established between metals and their salts are now known for a number of different metals. A detailed explanation of the principles on which they are determined would carry us somewhat beyond the scope of this article. Suffice it therefore to state that the starting-point is a determination, by an extremely ingenious method, of the potential-difference between metallic mercury and solutions of salts, and that the potential-difference between mercury and a normal aqueous solution of one of its salts has thus been shown to be 0.99 volt, the metal being electro-positive with regard to the solution. (By a 'normal' solution of a salt is meant a solution containing the molecular weight of the salt in grams. See SOLUTION). This fact known, there is no difficulty in determining the potential-difference for any other metal and its solutions. Indeed, let the problem be to determine the potential-difference established when metallic zinc is placed in a normal solution of zinc sulphate. To do this, we may construct a cell consisting of a mercury electrode in a normal solution of mercuric sulphate and a zinc electrode in a normal solution of the sulphate of zinc, the two solutions separated by a porous partition and the two metals connected by a wire. By direct determination, the electro-motive force of this cell may be shown to be 1.514 volts; and as the potential-difference between the mercury and its solution amounts to 0.99 volt, it is evident that the potential-difference between zinc and the normal solution of its sulphate must be 0.524 volt. In this calculation, the slight potential-difference between the two solutions has been neglected. In calculating the figures of the following table, however, that difference, too, has been taken into account; and so the figure for zinc, 0.51, is somewhat more precise than our figure 0.524. The table shows the potential-differences between metals and their salt solutions of normal concentration, the plus sign showing that the solution is electro-positive with regard to its metal, and the minus sign showing that the solution is electro-negative with regard to its metal.

Magnesium	+ 1.22	Iron..........	+ 0.06	Copper........	— 0.60
Zinc...........	+ 0.51	Nickel.......	— 0.02	Mercury......	— 0.99
Aluminium	+ 0.22	Lead.........	— 0.10	Silver..........	— 1.01
Cadmium...	+ 0.19	Hydrogen.	— 0.25		

The series is similar to part of the old electro-chemical order of Berzelius. (See historical section under CHEMISTRY.) Only, again, while that order was purely qualitative, the modern series represents an exact qualitative expression of the electrical properties of metals and besides refers to a definite concentration of their solutions. Since the potential-difference between a metal and a solution depends upon the solution-tension of the metal and the osmotic pressure of its ions in the solution, and since both the potential-difference and the osmotic pressure can be determined, it is evidently possible to find also the solution-tensions. The following table shows the results of such calculations based on the table given above:

Magnesium ...	10^{44}	Iron.............	10^{3}	Copper	10^{-12}
Zinc..............	10^{18}	Nickel	10^{-0}	Mercury.......	10^{-18}
Aluminium....	10^{13}	Lead...	10^{-3}	Silver	10^{-18}
Cadmium	10^{7}	Hydrogen....	10^{-4}		

The figures represent the solution-tensions in terms of atmospheres and may be changed to pounds per square inch by multiplying by 15. The solution-tension of iron, for example, equals a pressure of 15,000 pounds per square inch. The enormous tension of magnesium may serve to indicate how great may be the electrostatic counter-forces long before the amount of metal in solution has become appreciable.

ELECTROLYSIS. The electro-chemical principles developed above, together with the theory of electrolytic dissociation (see DISSOCIATION) explain the mechanism of electrolysis without any difficulty. We have seen above that in a voltaic cell chemical changes are used to produce electrical energy; in electrolysis, on the contrary, an electric current from some outside source is passed through the given system and causes chemical changes to take place in it. The laws of electrolysis may be found stated in the article ELECTRICITY.

TRANSFORMATION OF ENERGY. The term 'chemical affinity' is now often used, not only in connection with compounds, but also in connection with their transformations. It is a fundamental principle in modern exact science, that any change whatever that takes place in a given system without the supply of energy from without is capable of yielding mechanical work. Thus, a weight can be lifted by the expansion of a sufficiently compressed gas, and of course the greater the weight, the greater the work done. The greater the work done, the more the gas is cooled; for the work is done at the expense of the energy of the gas. If the same gas was allowed to expand the same amount in vacuo (i.e. without having to overcome any resistance), no work would be done, and therefore no fall of temperature would be observed; in other words, the total energy of the gas would remain unchanged; yet its capacity for doing work would obviously be diminished owing to the diminution of pressure. Physicists therefore distinguish between the total energy of systems and their free energy, the latter representing that part of the total energy which can be transformed into mechanical work when the system undergoes a spontaneous change. Evidently, the maximum work that can thus be obtained measures the free energy of the system; and as the free energy represents the 'driving power' that causes the change, it is evident that we have obtained an exact measure of that cause when we have measured the maximum work that can be yielded by the change. In the case of chemical transformations, it is that same 'driving power' which is now often referred to as the 'chemical affinity of reactions.' In the case of voltaic cells, the free chemical energy may be entirely transformed into electrical energy. If the cell is perfect, i.e. if it yields really the maximum of electrical energy that can be obtained from its chemical changes, then evidently the electrical energy measures the affinity of the chemical changes; for the electrical energy of a cell can be entirely transformed into mechanical work. Now, we have seen in the introductory section of this article that electrical energy is a product of two factors, quantity of electricity and potential-difference. The quantity of electricity passing through a cell is independent of the nature of the ions, and is proportional to the number of chemical equivalents of the ions entering or leaving the solution (Faraday's law), each chemical equivalent (in grams) carrying 96,540 coulombs of electricity. On the other hand, the total potential-difference of a cell is measured by its electro-motive force, and can be readily determined by the use of some 'standard' cell. It is, therefore, clear that the electrical energy of an electro-chemical process can be readily ascertained, and that the chemical affinity of any reaction in which acids, bases, or salts can be caused to take part is proportional to, and hence is measured by, the electro-motive force of a voltaic cell based on the reaction. It is further clear that, on the contrary, whenever the maximum mechanical work that can be yielded by a given transformation can be ascertained without the aid of an electric process, the electro-motive force of a cell based on the transformation can be calculated beforehand.

One more important point claims attention before we dismiss the subject of the energy-changes of voltaic cells. We have seen above that the chemical reactions of a cell can also take place without producing electrical energy. Thus, the reaction of a Daniell cell can be produced by simply immersing a bar of zinc into a solution of copper sulphate. In that case the change is accompanied by the evolution of a definite amount of heat. The question therefore arises, Can all that 'heat of the reaction' be transformed into electrical energy or not? At one time this question was answered in the affirmative ('Thomson's law'). But Willard Gibbs and Helmholtz have proved thermodynamically, and it has since been demonstrated experimentally, that the electrical energy of a cell need not by any means equal the heat of the reaction; that, on the contrary, the latter is generally greater than the former, so that even in perfect cells (producing a maximum of electrical energy) a rise of temperature might generally be observed. See THERMO-CHEMISTRY.

HISTORY. The earliest electro-chemical observation on record was made by Deimann and Paets van Troostwyk, of Haarlem, in 1789. The experiment was carried out as follows: a glass tube with one end closed and the other open, and with a metal wire sealed into the closed end, was filled with water and inverted over a dish of water; a second metal wire was passed through the open end of the tube, up to within some distance of the end of the upper wire; and electric sparks were caused to pass between the ends of the two wires. The result was that water was decomposed into its constituents, oxygen and hydrogen, a mixture of which collected in the upper part of the tube. As long as the end of the upper electrode remained immersed in water, nothing further happened; but the instant the end of the electrode became exposed to the mixture, a violent explosion took place, owing to the re-combination of the two elements. In a similar manner, Ritter afterwards carried out the first true electrolysis, using silver wires as electrodes and a solution of a silver salt as the electrolyte. Then came Volta's celebrated experiments, which resulted in his invention of voltaic batteries (see VOLTAIC BATTERY); and in 1795 Volta was able to prepare the first electro-chemical series. An appreciation of the work of Davy and Berzelius, and of the sway of Berzelius's ideas exercised for many years in the science of chemistry, may be found in the article CHEMISTRY (historical section). Faraday's discovery, in 1834, of the true laws of electrolysis marked a great step forward both in chemistry and in the science of electricity. The conception of energy, of its several forms, and of their mutual transformations, was developed in course of the fifth and sixth decades of the nineteenth century, and in 1847 Helmholtz first advanced the belief that the heat of the chemical reactions of a cell may be entirely transformed into electrical energy. Having been again brought forward by Thomson in 1851, the belief became known in science as 'Thomson's law.' The researches establishing the true relation were carried out by Gibbs in 1878 and by Helmholtz in 1882, and were completed by the experimental investigations of Czapski and Jahn. In 1886 Van't Hoff introduced the modern theory of osmotic pressure (see SOLUTION), and in 1887 Arrhenius advanced the theory of electrolytic dissociation (see DISSOCIATION), which is at the basis of the most important chapters of modern electro-chemistry. The idea that electrolytes must be more or less broken up in their solutions originated with Clausius; but Arrhenius was the first to give to it its present quantitative form, to connect it with the theory of solutions, and to demonstrate its great importance for theoretical chemistry. The researches of Hittorf on the relative rates of transportation of the ions during electrolysis were carried out as early as 1853 to 1859, but gained great scientific importance only after Arrhenius established his theory of dissociation. Other important names connected with the progress of general electro-chemistry are those of Ostwald, Nernst, Planck, Le Blanc, and Kohlrausch. The concept of electrons originated in Helmholtz's lectures on Faraday's ideas of electricity, delivered in London in 1881. Among those who have contributed to the recent development of this promising idea are Nernst, Abegg, and Bodländer.

BIBLIOGRAPHY. Jahn, *Grundriss der Elektrochemie* (Vienna, 1895); Le Blanc, *The Elements of Electro-Chemistry*, translated by Whitney (New York, 1896); Ostwald, *Elektrochemie, ihre Geschichte und Lehre* (Leipzig, 1896); Loeb, *Grundzüge der Elektrochemie* (Leipzig, 1897); Haber, *Grundzüge der technischen Elektrochemie auf theoretischer Grundlage* (Leipzig, 1898); Lüpke, *Grundzüge der Elektrochemie* (Berlin, 1899); Jones, *The Theory of Electrolytic Dissociation and Some of Its Applications* (New York, 1900); Jones, *Outlines of Electro-Chemistry* (New York, 1901); Arrhenius, *Lehrbuch der Elektrochemie* (Leipzig, 1901); Nernst and Borchers (editors), *Jahrbuch der Elektrochemie* (Halle). See CHEMISTRY; ELECTRICITY; VOLTAIC CELLS; DISSOCIATION; SOLUTION; ANALYSIS, CHEMICAL.

ELECTRO-CHEMISTRY, INDUSTRIAL. Electro-chemical processes are now employed in extracting metals from their ores and in parting them from their alloys; in the deposition of certain of the finer metals upon the surfaces of baser metals, and other materials; in the manufacture of various chemical products employed in the arts, and for various miscellaneous purposes. The processes of electro-metallurgy, by which metals are extracted from these ores or parted from these alloys, can be best considered in the articles describing those metals.

The electro-deposition of certain metals upon the surfaces of other substances is called electroplating. When electroplating is employed as a means of copying printing-type, medals, seals, woodcuts, etc., it is called electrotyping. The metals commonly used for electroplating other metals are copper, nickel, silver, and gold, which are in each case made the anode or positive pole of a voltaic current, while the metal to be coated is made the cathode or negative pole. The electrolyte or immersing bath is differently composed, according to the metal which is to be deposited.

Electrically deposited copper is now largely used to protect and ornament architectural ironwork, the coating varying from 8 to 10 ounces per square foot for smooth plates, to 14 to 16 ounces for rough cast-iron. For interior ornament electro-bronzing is often employed, using a coating of from 2 to 3 ounces per square foot. In Europe it is common practice not to deposit the plating directly on the iron, but on a suitably prepared varnish, thus avoiding the necessity of cleaning, but at the same time giving a plating which is easily knocked off; in the United States the iron is very carefully cleaned and the copper deposited directly upon it, and so firmly that the original metal with its coating may be bent or twisted without rupturing the plating.

In the electro-deposition of nickel, or nickel-plating, the bath consists of nickel-ammonium sulphate dissolved in boiling water. The articles to be plated are first cleaned with abrasives or acids, and after the plating is finished are polished. Gold and silver plating are employed in making jewelry, ornaments, and tableware of all descriptions. In silver-plating the bath used is a solution of chloride of silver, cyanide of potash, and water. In gold-plating either a hot or a cold solution may be used, and each is variously compounded, according to the result which it is desired to obtain. After the plating has been deposited the article is suitably polished. The deposition of copper in electrotyping is one of the most important applications of electro-chemistry and plays an important part in printing, under which title it is described. See article Electroplating.

Electric Furnace. In the electric furnace there is not, as a rule, any electrolytic decomposition or electrolysis proper, but merely an extremely high temperature caused by the passage of the current through a mixture offering resistance. Thus in the thermo-electric production of the *Carbides*, by the action of the high temperature, a mixture of silica (sand), sodium chloride (salt), and coke silicon carbide (carborundum) is obtained. Similarly, by the action of the high heat on limestone, coke, and a flux, we obtain calcium carbide, from which acetylene gas is produced. The thermo-electric production of phosphorus has now replaced the older methods. Calcium phosphate is mixed with charcoal and sand and heated in the electric furnace, when the phosphorus liberated is distilled off in a current of coal gas. Artificial graphite is also made in connection with the manufacture of carborundum by volatilizing all but the carbon at still higher temperatures. See Electric Furnace.

In the production of chemical compounds by electrical action, we may mention, first, the electrolysis of alkaline chlorides. If the chloride, as sodium chloride (salt), is in the fused state, as in the Acker process, we obtain metallic sodium and chlorine. By a secondary reaction, that of steam on the sodium-lead alloy first obtained in this process, solid caustic soda is obtained, while the liberated chlorine is used to produce chlorinated lime or bleaching powder. If the chloride is in solution, as in brine, we may, by using a diaphragm, obtain caustic soda solution and chlorine at the two electrodes, or when no diaphragm is used, we may obtain as the sole product of the electrolysis an alkaline hypochlorite or a chlorate, according to conditions of temperature. The production of hypochlorite solution is now largely made use of for bleaching in textile works and in the paper industry. The production of chlorates electrolytically has largely replaced the older methods. (See Sodium.) The decomposition of fused alkaline hydroxides is also practiced, as in the production of metallic sodium by the Castner process, and latterly the production of metallic magnesium and calcium. Aluminum is produced in the Hall process by the electrolysis of aluminum oxide in a bath of fused cryolite. A number of organic chemical compounds are also produced at present by the aid of electrolysis. Chloroform and iodoform are thus made by the action of nascent electrolytic chlorine or iodine upon alcohol or acetone. Chloral is also a product of a similar action. A number of organic dyes are also produced with the aid of electrolytic action, either by oxidation or reduction. Among the lesser applications of electro-chemistry may be mentioned the purification of sewage, the tanning of hides, the aging of wines, and the production of ozone.

Bibliography. For additional information consult: Moissan, *Le foure électrique* (Paris, 1897); Borchers, *Elektrometallurgie* (Brunswick, 1896); Haber, *Grundriss der technischen Elektrochemie auf theoretischer Grundlage* (Munich and Leipzig, 1898); Gore, *The Art of Electrolytic Separation of Metals* (London, 1894); Gore, *The Art of Electro-Metallurgy, including all known processes of Electro-Deposition* (New York, 1900); Ahrens, *Handbuch der Elektrochemie* (Stuttgart, 1896); also *The Electro-Chemical Industry* (Philadelphia, current).

ELECTRO-CULTURE OF PLANTS. The culture of plants under electric stimulus. It has long been known that plants respond to electric stimuli, and many investigations have been made to ascertain practical means of realizing the benefits of this force. The subject naturally divides itself into the direct use of the current when applied to the seed, plant, or soil, and the use of the electric light. The Abbé Nollet seems to have been the first to notice that the germination of seeds could be hastened by electrifying them before planting. Later, Specnew stimulated, for a few minutes, moist seed of beans, peas, barley, and sunflower, after which they were planted. Such seed germinated in half the time required for untreated seed. His experiments were repeated at the Massachusetts Hatch Experiment Station, where the germination was accelerated and the total germinations increased. Direct experiments upon the growth of plants have been made, in which zinc and copper plates, connected by wires, were placed in the soil in which the plants were grown, or wires were run through the soil and connected with a battery or electric machine of some sort. The first method has been successfully tried in England and Germany with the result that larger crops of peas, barley, and grass were obtained from electrified plots of ground. The second method has been tried many times, the experiments of Warner at the Massachusetts Hatch Experiment Station being of this class. In 1893 he grew parsnips, lettuce, carrots, turnips, beets, salsify, onions, peas, and tomatoes. The seed of most varieties germinated sooner, developed better, and the tomatoes ripened earlier, where the soil was subjected to the electric current. The nearer the plants were to the electrodes the better was the growth. Various forms of accumulators of atmospheric electricity have been tried, with greater or less success. That atmospheric electricity influences growth is shown by the experiments of Grandeau, who grew maize inside an insulated cage. The stalks were much smaller than those receiving the effect of the electricity of the air. The effect or advantage secured is explained by the fact that the electric current induces more rapid changes in the seed and soil, or that electrified plants are enabled to take up carbon dioxide more rapidly owing to the treatment.

The effect of the electric light has been very fully investigated at the experiment stations of Cornell University and West Virginia, the arc light being used at the former station and the incandescent lamp at the latter. In the case of plants grown under the electric light, the effect seems to be exerted through the hastening and prolonging of the assimilation of the plants. A large number of vegetable and flower and foliage plants have been experimented upon. In the experiments with the arc light it was soon found that the naked light exerted an injurious effect upon many plants. This is believed to be due to the presence of ultra-violet rays, the spectrum of the electric light being unlike that of sunlight. A glass screen, as an ordinary globe, was found to cut out the injurious rays and to allow the beneficial rays to pass through. Hanging an arc light above a greenhouse had the same effect. By this method the flowering period of many plants was, in some cases, hastened, as with Easter lilies, being advanced as much as ten days, and the colors were more intense. With vegetables the best results were secured with lettuce, plants of which were forced a week or more in advance of those in the unlighted portions of the house. This fact has been taken advantage of in a number of instances in the commercial forcing of lettuce. Similar results were obtained with the incandescent light at the West Virginia Experiment Station.

The practical utilization of the electric light in horticulture seems at present limited to forcing lettuce and flowers. With these, illumination for a month until midnight seems to give results commensurate with the expense. The whole subject is hardly beyond the experimental stage as yet, except as noted above. See ELECTROTAXIS; ELECTROTROPISM; GERMINATION.

ELECTROCUTION (from Gk. ἤλεκτρον, *ēlektron*, amber, electricity; a barbarous formation on the analogy of *execution*). A method of inflicting the death penalty by passing through the body of the doomed criminal a current of electricity. It represents the latest attempt to rob the infliction of the death penalty of the revolting features of the prevalent mode of execution by hanging. While not entirely successful in this aim, it has in some parts of the United States been accepted as a more humane method of capital punishment than that which it is aimed to supersede. It was adopted in New York in 1888, Ohio in 1896, Massachusetts in 1898. The legislation which put it into effect in New York was based upon the recommendation of a commission appointed "to investigate and report to the Legislature the most humane and approved method of carrying into effect the sentence of death in capital cases." Notwithstanding the eminence of the commissioners, the prolonged and careful investigation which they gave to the subject, and the deliberate and cautious conduct of the Legislature in dealing with the report, the statute adopted for the purpose of giving effect to the conclusion of the commission, and changing the mode of executing the death sentence from hanging to electrocution, was assailed as unconstitutional, on the ground that it provided for the infliction of a cruel and unusual punishment. This contention was not sustained by the courts. On the contrary, they agreed with the commission that the application of electricity to the vital parts of the human body, under the conditions and in the manner contemplated by the statute, must result in instantaneous and painless death, and therefore would be a far more humane method of inflicting the death penalty than that by hanging. See *People ex rel. Kemmler* v. *Durston* (119 New York Reports, 557, 1890); 41 *Albany Law Journal* (242, 361, 382, 425, 489, 1890). Consult also the authorities referred to under PUNISHMENT.

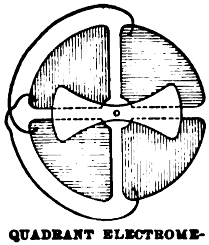
ELECTROLYSIS. For theoretical discussion, see ELECTRICITY; and ELECTRO-CHEMISTRY, GENERAL.

ELECTROLYSIS OF GAS AND WATER MAINS (from Gk. ἤλεκτρον, *ēlektron*, amber + λύσις, *lysis*, dissolution, from λύειν, *lyein*, to loose). The eating away or disintegrating of the metal, caused by stray electrical currents. Electric street-railway systems are chiefly responsible for this action, through the lack of proper facilities for the return currents from the car motors to the power-house. The softening or pitting of the pipes takes place where the current leaves them, particularly at joints, where the electrical resistance of the metal is greater than that of the surrounding earth. The danger from this source was so little realized in the early days of electric street railways that direct electrical connection was sometimes made with gas or water mains. Since about 1892 the problem has been assuming more and more serious proportions, and there have been numerous papers and discussions on this subject at the meetings of the various water-works and gas associations. At the points of departure of these stray currents, whether permanent or temporary, the metal, be it iron, steel, or lead, is liable to become so badly decomposed as to be in serious danger of giving way. This is particularly true of water-mains, which are under very many times as much pressure as gas-mains. When water-mains are thus broken great damage may be done by the escaping water, and a city or portion of a city might be at the mercy of the flames if a fire should break out. If, instead of the mains, the service-pipes or house connections give way, the danger and inconvenience are not so great, but no end of trouble and much needless expense are often caused. Where gas-mains fail, the ground becomes more or less permeated with gas, and if the latter has an opportunity to accumulate, an explosion may occur. Since 1890 water-works managers have had more and more trouble with electrolysis, and in several instances have felt compelled to sue street-railway corporations for damages and to ask the courts to enjoin the trolley companies from a continuance of the conditions which give rise to so much anxiety, expense, and danger. The final decisions of the courts have in all cases, however, held the railway companies blameless, provided the latter used all reasonable means to reduce the electrolytic action. It should be understood that the rails of the trolley lines are injured where the current leaves them, and that these imperfections in the circuit increase the power required to operate the railways. The remedy for the evil is to provide ample and unfailing means for the return of the current to the power-house. Much can be effected, in the case of the ordinary single-wire overhead trolley, by a thorough bonding of the rails; but the consensus of opinion among water-works officials is that this is insufficient or unreliable, and that either the double overhead-trolley system or an underground return wire should be provided. Consult the *Journal of the New England Water-Works Association*, and the *Proceedings of the American Water-Works Association* for professional and technical papers on this subject.

ELECTRO-MAGNETIC INDUCTION. See INDUCTION.

ELECTRO-METALLURGY AND ELECTRIC SMELTING. See METALLURGY; ALUMINIUM; COPPER; GOLD; SILVER; PLATINUM; ZINC.

ELECTROM'ETER (from Gk. *ἤλεκτρον*, *ēlektron*, amber + *μέτρον*, *metron*, measure). An instrument for measuring the difference of electrostatic potential between two charged conductors. The electroscope (q.v.) and the torsion balance (q.v.) are forms of electrometers, and can be used to indicate the amount of electricity with which a given conductor is charged; but there are finer and more accurate instruments which are also based on the attraction and repulsion of two charged conductors. In the Peltier electrometer a thin vane of aluminium has attached to it a small magnet, whose magnetic moment is known, and which, being suspended at a point where the intensity of the earth's magnetism has been ascertained, enables us to determine the amount of any force which deflects it. There is a similar fixed arm which is charged with electricity of one kind, while the first vane is charged with electricity of the same kind. Consequently, there is a repulsive action between the two, whose extent depends upon the charges which the two conductors have. The capacity of these conductors is always the same; consequently, the amount of electricity with which they are charged must depend upon the difference of potential; and this rule holds good in most forms of electrometers. A more accurate form of electrometer consists in balancing the mutual attraction of two charged plates by weights. A charged disk with a plain surface is attached to one arm of a balance, but electrically insulated from its metallic parts. By means of balancing weights or the movement of the arm of the balance, the strength of attraction can be determined. This device, which was invented originally by Snow Harris, was later improved by Lord Kelvin, and was an instrument quite delicate in its action. In Lord Kelvin's hands it furnished valuable results, and was known as an absolute electrometer. He also devised the quadrant electrometer, where there is a needle of thin aluminium suspended over four quadrants which are connected in pairs. A charge of electricity is communicated to one pair of quadrants diametrically opposite each other, and a charge of the opposite kind is given to the other pair, or they are connected with the earth. The needle, therefore, will be attracted by one set of quadrants and repelled by the other, the amount of deflection measuring the potential-difference to which the quadrants are charged. The action of the apparatus will be understood on reference to the illustration. Here the needle is charged by an electrophorus, or is in contact with a Leyden jar, and the two sets of quadrants are charged to the difference of potential which it is desired to measure. The amount of deflection can be determined accurately by using a reflecting mirror on the needle and a telescope and scale, as is done with the galvanometer (q.v.), and it is possible to measure even such small differences of potential as those of the two elements of a cell.



QUADRANT ELECTROMETER.

THOMSON ELECTROMETER.

The form of electrometer illustrated is supplied with a replenisher in the shape of a small Leyden jar at its base, and the quadrants are made double, or box shape, to increase the effect. In the electrostatic voltmeter used in the measuring of alternating currents a vane of aluminium is delicately pivoted, so that it may revolve between two brass plates from which it is insulated. The vane is connected with one conductor from the alternator, or other source of current, while the other conductor is connected with the fixed brass plates. When the vane and the plates are charged, there is a repulsive action between them, and the vane is revolved. The pointer attached to one arm moves over a graduated scale, indicating the difference of potential, and counterweights of different amounts may be placed on the lower arm so that the range of the instrument can be varied and several sets of readings for different ranges of potential obtained. By increasing the number of vanes and fixed plates, the sensitiveness of the instrument is increased, and it is then termed a multicellular voltmeter. In the study of radioactivity, quadrant electrometers of very small size, and therefore small electrical capacity, are used where the needle is made of paper, aluminium foil, or silvered mica, suspended by a quartz fibre or very fine phosphor bronze strip, and so light that no damping beyond air friction is required. With a fine fibre the sensitiveness may be as great as a scale division for a potential difference between the quadrants of a ten thousandth of a volt, so that currents can be measured far smaller than with the best galvanometer. The capillary electrometer of Lippman and Dewar, used to measure small differences of potential, consists of a glass tube placed horizontally, with its ends turned up and filled with dilute acid. At the middle of this tube is placed a drop of mercury, and as the current passes through the acid the drop travels along the tube toward the negative pole. This action is due to a change in the surface tension between the mercury and the acid, caused by the liberation of gas. Other electrometers figure mostly in experiments in statical electricity and for accurate determinations requiring careful manipulation. Consult Thompson, *Elementary Lessons in Electricity and Magnetism* (New York, 1902); Müller-Pouillet-Pfaundler, *Lehrbuch der Physik* (Brunswick, 1898); and Rutherford, *Radioactivity* (Cambridge, 1905).

ELECTRO-MOTIVE FORCE. See Electricity, where, under Electrokinetics, the fundamental ideas of electricity are discussed. See also Electro-Chemistry, General.

ELECTRON. A particle of matter, charged with negative electricity, having a mass about one-thousandth part of that of the hydrogen atom, probably a common constituent of the atoms of all chemical elements. The electron hypothesis assumes that the charge on an electron is the natural unit or atom of negative electricity, and that the existence of a negative charge on a body results only from the congregation there of electrons.

The recognition of the separate existence of particles of mass smaller than that of the hydrogen atom is due to Sir William Crookes, who took the position that the luminous streams ("cathode rays") that proceed from the cathodes of highly exhausted vacuum tubes are composed of tiny material particles moving away from the cathode like a storm of projectiles. He did not definitely commit himself to any theory as to the precise nature of these particles, but recognized them as being somehow different from the ordinary molecules of matter, and maintained that the cathode rays presented "a new or fourth state" of matter. His views, though opposed strenuously at first by competent authorities, have been substantiated and extended by subsequent experiments.

J. J. Thomson, in 1897, succeeded in completely demonstrating the general correctness of Crookes' hypothesis and in defining very closely the nature of the rays. He found that they consisted of negatively charged particles, moving with velocities varying between 20,000 and 50,000 miles per second, and that the mass of these particles was about $\frac{1}{1000}$ that of the hydrogen atom. He also showed that electrons of the same small mass could be produced in a variety of ways. They are emitted from a metal plate exposed to ultra-violet light, from the surface of glowing metals, from the electric arc, and from flames. In all these cases an external stimulus and supply of energy is necessary to free the electron, but it is found that the radioactive substances, radium, thorium, uranium, etc., spontaneously and continuously emit these small negatively charged particles with a wide range of velocities, in some cases approaching that of light. The charge on the electron in all these cases is found to be the same and equal to 3.1×10^{-10} electrostatic units. It has been shown that the charge carried by the electron or a gaseous ion, is the same as that on a monovalent ion in electrolysis, and it thus seems to be a natural and indivisible unit of electricity.

The constancy of the charge and the mass of the electron, whatever its origin, naturally led to the view that all matter contained this primordial element. The conception of an atom consisting of a number of mobile negative electrons embedded in a sphere of positive electrification was embodied by Lord Kelvin in a paper called "Aepinus Atomized." This electronic model has been further developed by J. J. Thomson, who has investigated the properties of model atoms, consisting of a large number of rapidly revolving electrons held in equilibrium by these mutual repulsions and the forces due to a fixed distribution of positive electricity. He has shown that such systems imitate strikingly many of the most fundamental properties of chemical atoms.

Such an atom furnishes a ready means of explaining the mechanism by which the radiation of the electromagnetic waves of light by matter is effected. These charged particles within the atom radiate no energy unless subjected to an acceleration, but if one is displaced from its position of equilibrium, it will vibrate about its mean position of rest and radiate electromagnetic energy into space until brought to rest. From this view of the origin of radiation Lorentz pointed out, that if a source of light were subjected to an intense magnetic field, it was to be expected that the lines of the spectrum should be broadened, and this prediction was later experimentally verified by Zeeman, who found that the spectrum lines were not only spread out, but completely split up into three or more lines. Measuring the distance between these lines it may be shown that the ratio of the charge to the mass of the vibrating particles to whose disturbance the lines are due, is the same as the ratio for the electron as reached by other methods.

The problem of the conduction of electricity along metal conductors has also been attacked on the same ground by Thomson and Drude. On the electronic theory all conductors are supposed to contain a large number of free negative electrons which can pass freely between the atoms of matter. These electrons are held fast in the metal by the attraction of the corresponding quantity of positive electricity carried by the atoms of matter. Under the influence of an electric field, the electrons are set in motion and act as the carriers of the current, the positive carriers remaining either immobile or moving very slowly.

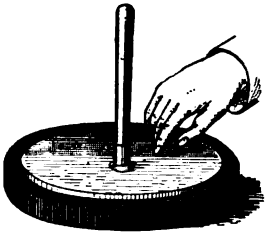
The nature of the electron, whether it is a fragment of an atom of matter or a disembodied electric charge, so that all its properties can be accounted for by purely electrical theory, has been somewhat elucidated by the following considerations. A moving charge behaves like an electric current and produces a magnetic field about it. Magnetic energy therefore is stored up in the medium and travels with the moving charge, and the amount of this energy is proportional to the square of the speed for speeds small in comparison to the velocity of light; but when a mass is set in motion it possesses kinetic energy proportional to the second power of its speed. As work is done when the speed of a mass is changed, so it must be done when the speed of an electric charge is changed, therefore an electric charge possesses inertia or mass, the fundamental property of matter. It will tend to resist any acceleration. If we consider a charged body, its inertia or mass is due partly to the neutral body, and partly to the charge on it.

In experiments by Kaufman to determine how far the mass of the electron results from the charge associated with it, radium was used as a source of electrons, as it expels electrons with a wide range of velocities, some being as high as .9995 that of light. By an ingenious experiment Kaufman determined the mass of the electron at different speeds, found that it increased rapidly as the velocity of light was approached, and by comparison of theory with experiment, showed that the mass of the electron was purely electrical in origin. It is therefore probable that it is a disembodied charge, possessing, however, the characteristic property of mass in virtue of its charge.

Bibliography. Consult: Thomson, *Conduction of Electricity through Gases* (Cambridge, 1903); Lodge, articles on "Electron," *The Electrician* (London, 1903); Abraham, *Mechanik des Electrons* (Göttingen, 1902); Abraham and Langevin, *Les quantities elementaires d'Electricite: Ions, Electrons, Corpuscles* (Paris, 1905).

ELECTRON HYPOTHESIS. See Electro-Chemistry, General.

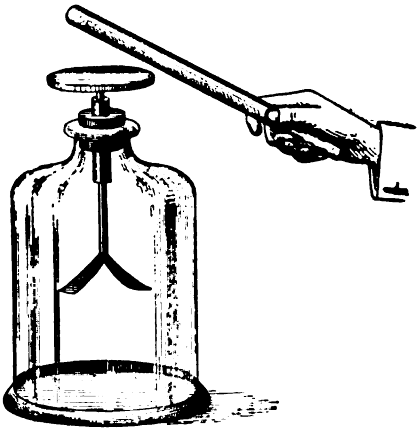
E'LECTROPH'ORUS (Neo-Lat., from Gk. ἤλεκτρον, *ēlektron*, amber + -φορος, *-phoros*, bearing, from φέρειν, *pherein*, to bear). This apparatus consists of a circular disk of hard rubber, vulcanite, shellac, or other insulating material on a metallic surface or form, and a movable metal cover with an insulating handle. The disk is first negatively electrified by being struck briskly with a foxtail or catskin, and then the metal cover is placed on it. The next step is to touch the cover with the finger, which may produce a slight spark, and then grasping the insulating handle to raise it, keeping it parallel to the surface of the disk. If presented to the finger or any body in contact with the ground, a spark will ensue, and this can be secured for a number of times by simply placing the cover on the disk, touching it with the finger, and removing. This process can be repeated until the disk loses its charge by leakage into the air. The action of the electrophorus depends upon induction, and the underlying principle is the same as in the electrical machine and other electrical apparatus. When the vulcanite or shellac is rubbed it is negatively charged, the charge residing somewhat below the surface. Now, when the cover is put on, the negative charge of the disk acts on the plate inductively, attracting the positive electricity to the lower side and repelling the negative to the upper side. When the finger is brought into contact with the metal it affords an opportunity for this negative electricity to escape to the ground, and leaves the cover with a positive charge which is held bound. Raising the cover now positively charged, and bringing it near some object in connection with the ground, we have a sharp spark as the equilibrium is restored and the plate discharged. The electrophorus can be used to charge bodies and perform a number of experiments in frictional electricity. See Electricity.


ELECTROPHORUS.

ELECTRO-PLATING. A process by means of which salts of gold, silver, platinum, nickel, copper, or other costly metals are decomposed by an electric current, a coating of metal being deposited on the surface of objects made of some cheaper metal. In 1838, Jacobi, of Saint Petersburg, published a description of a method capable of reproducing any line engraved on copper into a relief by galvanic process. Soon after, Thomas Spencer, of Liverpool, independently announced his discovery of a similar process. From these discoveries have grown the extensive electro-plating processes that include the deposition of gold, silver, copper, nickel, and other metals. In order to obtain a reproduction—as, for instance, a medal or similar object—a mold or cast is made on which the layer of metal is to be deposited by the current. This is sometimes of an inferior metal, as base or white metal; or, as in the case of type, of a mold made of some non-conducting material, such as wax or gutta-percha, which must be carefully brushed over before immersion with very finely powdered graphite. (See Printing.) In order that the metal to be deposited may adhere perfectly to the object to be plated, it is necessary that it shall be perfectly clean; it is therefore usually dipped in a cleansing solution, as of an acid or a caustic alkali, and then rinsed in water to remove all traces of the cleansing solution. The Bunsen, Daniell, Grove, and Smee batteries are often used to supply the current for electro-plating small objects; but for commercial purposes it is customary to employ a dynamo machine. The solutions employed in electro-plating are very numerous, but in ordinary commercial practice they consist of the following salts dissolved in distilled water: For *gold*, a solution of gold cyanide and potassium cyanide; for *silver*, a solution of silver cyanide and potassium cyanide; for *copper*, an ammoniacal solution of copper and potassium cyanide; for *nickel*, a solution of nickel and ammonium sulphate, or of the corresponding chloride. The electrolysis is effected in a convenient bath, which, when small objects are to be plated, may be of glass or porcelain, but in commercial practice is a trough lined with a non-conducting material. The latter may be wood or cement, in the case of silver; zinc, in the case of copper; and asphaltum, in the case of nickel. The object on which the metal is to be deposited is connected by a wire with the negative electrode of the battery, while the positive pole is connected with an anode of the same metal which is to be deposited on the object, thus closing the circuit. As fast as the solution is decomposed the liberated acid dissolves the metallic anode, in consequence of which the solution is kept in about the same state of concentration.

Consult: McMillan, *Treatise on Electro-Metallurgy* (London, 1899); Partridge, *A Practical Treatise on the Art of Electrotyping* (Chicago, 1899); Urquhart, *Electro-Plating, A Practical Handbook on the Deposition of Copper, Silver, Nickel, Gold, Brass, Platinum, etc.* (London, 1894); Van Horne, *Modern Electro-Plating* (Chicago, 1897); Watt, *The Electro-Plating and Electro-Refining of Metals* (London, 1902); Weston, *Electro-Platers' Handbook* (Chicago, 1905). See Electro-Chemistry, Industrial.

ELECTROSCOPE (from Gk. ἤλεκτρον, *ēlektron*, amber + σκοπεῖν, *skopein*, to look). An instrument for the detection of the presence of electricity. It depends for its action on the principle that bodies charged with like electricity repel, while those charged with unlike electricity attract, each other. The ordinary pith-ball suspended on a silk thread is the simplest form of the instrument. The most common type of electroscope is that devised by Bennet in 1787, and known as the gold-leaf electroscope. It consists of two strips of gold leaf, or thin aluminium foil, suspended from the lower extremity of a conductor within a glass bottle or jar. The upper end of the conductor terminates in a ball, or a plate in case the instrument is to be used as a condensing electroscope. (See CONDENSER.) If a body charged with positive electricity is brought near to the knob of the electroscope, the negative electricity will be attracted to the knob and the positive repelled to the leaves, which then diverge. If now the finger is touched to the knob, the positive electricity is drawn off and the leaves collapse, while the negative electricity is held bound. Removing the charged body, the leaves will then diverge again, charged with negative electricity. In this case the instrument can be used to determine the nature of the charge of a body brought near it, as with a positive charge the leaves will collapse, and with a negative charge spread farther apart. In the Bohnenberger electroscope a strip of gold leaf is suspended between the poles of a dry pile (q.v.). If a charge is communicated to the gold leaf it will be deflected toward one or the other of the two poles.


ELECTROSCOPE.

Much use has been made of the gold-leaf electroscope in the study of radioactivity, and several forms of the instrument have been devised that are used as electrometers rather than electroscopes. For the sort of measurements necessary in the study of the natural ionization or conductivity of the atmosphere, and the like, a well-designed gold-leaf electrometer has as great sensitiveness as a quadrant electrometer, is almost as reliable, and has the advantage of extreme simplicity. For a description of these modern electroscopes, see Rutherford, *Radioactivity* (Cambridge, 1905).

ELECTROTAXIS (Neo-Lat., from Gk. *ἤλεκτρον*, *ēlektron*, amber + *τάξις*, *taxis*, arrangement, from *τάσσειν*, *tassein*, to arrange). The sensitiveness of motile organisms to the direction of an electric current passing through the medium in which they are living. As yet almost nothing is known about it in plants. It bears the same relation to electrotropism that chemotaxis does to chemotropism. See ELECTROTROPISM.

ELECTROTROPISM (from Gk. *ἤλεκτρον*, *ēlektron*, amber + *τροπή*, *tropē*, a turning, from *τρέπειν*, *trepein*, to turn). Sensitiveness of plant organs to the electric current; so called in analogy to other tropisms. (See GEOTROPISM, etc.) It has been very little studied, and about all that has been demonstrated is that certain roots, when grown in a liquid medium through which an electric current is passing, bend toward the anode ('positive pole'), while others bend toward the cathode ('negative pole'). It also appears that the direction of bending may sometimes be reversed by an increase in the voltage ('strength') of the current. Many, perhaps all, of these instances of electrotropism are nothing more than manifestations of chemotropism toward the products of chemical dissociation, which gather at the two electrodes. See ELECTRO-CULTURE OF PLANTS.

ELECTROTYPING. See ELECTRO-CHEMISTRY, INDUSTRIAL; ELECTRO-PLATING; PHOTO-ENGRAVING; PRINTING.

ELECTRUM (Lat., Gk. *ἤλεκτρον*, *ēlektron*, amber, probably on account of its color, *ἤλεκτρος*, *ēlektros*, alloy of gold and silver). A term applied to native alloys of gold and silver. According to Pliny, the term electrum was applied to native gold containing at least 20 per cent. of silver. Electrum was used since the seventh, and possibly even since late in the eighth century B.C. Its earliest usage was limited to purposes of inlaying; but later it was very extensively used as a material for coins.

ELEGIT, ESTATE BY. An early form of creditors' security, created by the Statute of Westminster II. (13 Edw. I., c. 18). It arises upon the levy of a *writ of elegit*—so called because the statute gave a creditor the option after judgment to have execution either by the writ of *fieri facias* (which was limited to personal property), or by the new writ, permitting him to seize not only the chattels of the debtor, but one-half of his lands as well. The creditor, upon levying the writ, was regarded as having a conditional estate in the lands so held, not unlike the modern mortgage, which estate, because it was held as security for a personal debt, was treated as personal property ('chattel real' was the technical description) which would descend to the creditor's executor and not to his heir. The payment of the debt for which the writ was levied divested the estate by elegit and revived the title of the debtor. This remedy by elegit proved so convenient that it was subsequently extended so as to permit the seizure of the whole of the debtor's lands, and in this form it has survived to the present time in England and some of the United States. Originally the creditor could only hold the lands—taking the rents and profits—until the debt was satisfied; but the power to sell and apply the proceeds to the debt is now usually an incident of the estate by elegit. See CHATTEL; EXECUTION; and consult the authorities referred to under the latter title.

ELEGIT (Lat., he has chosen), WRIT OF. A form of execution first authorized by the Statute of Westminster (13 Edw. I., c. 18), for the seizure and sale of lands owned by a judgment debtor. At common law, land was not liable for the debts of its owner, because its forced sale to a stranger would have resulted in the destruction of the feudal relation of lord and tenant. By the Statute of Westminster, however, the judgment creditor was allowed to choose between a writ against the debtor's land and an execution against his person or chattels. The new writ was called an elegit, because it represented this choice or election on the part of the creditor. At first it was limited to one-half of the debtor's lands, but by 1 and 2 Vict., c. 110, § 11, it was extended to all of his real estate. A levy of this writ and a sale under it of any quantity of land, however small, works a satisfaction of the debt, however large. The creditor seeks, therefore, to exhaust all the personal property of the debtor before enforcing an elegit against his land. Consult Kent and Blackstone, and see EXECUTION.

ELEGY (Lat. *elegia*, Gk. ἐλεγεία, *elegeia*, elegy, from ἔλεγος, *elegos*, mourning song). A word employed at an early period by the Greeks to designate any poem written in distichs. The alternation, peculiar to this measure, of the hexameter with the pentameter gives to this species of poetry its individual character. Earnest, long-sustained feelings, rarely violent passions, are expressed in the elegy. Of the numerous elegies of the Greeks, few have come down to us. Those still extant consist partly of encouragements to patriotism. Among the Romans, Catullus was the first good elegiac writer; after him came Propertius, Tibullus, and Ovid. Tibullus, in particular, brought the erotic elegy to its highest perfection. In modern times the term elegy is applied where a tone of melancholy pervades the sentiments.

Elegy, in music, is a composition depicting feelings of mourning, sadness, longing or ardent desire, and love.

ELEGY WRITTEN IN A COUNTRY CHURCHYARD. A poem by Thomas Gray (q.v.). It was finished in 1750, although it was begun seven or eight years before. The original churchyard is thought to have been that of Stoke-Pogis, in Buckinghamshire. The poem first appeared on February 16, 1751, and rapidly ran through a number of editions.

ELEMENTAL SPIRITS. Beings who, according to the popular belief of the Middle Ages, presided over the four 'elements,' living in and ruling them. In a work attributed to Paracelsus, the elemental spirits of fire are called salamanders; those of water, undines; those of the air, sylphs; and those of the earth, gnomes.

ELEMENTARY SCHOOLS. See COMMON SCHOOLS; SCHOOLS.

ELEMENTS. In astronomy, the numerical quantities employed in the construction of tables of the planetary motions. They include: (1) The semi-major axis of the orbit; (2) the eccentricity; (3) the inclination of the orbital plane to the ecliptic plane; (4) the longitude of the ascending node; (5) the longitude of the perihelion; (6) the epoch; (7) the period, or the angular daily motion. See COMETS; PLANETS; ORBIT.

ELEMENTS, CHEMICAL. See CHEMISTRY; ATOMIC WEIGHTS; PERIODIC LAW.

ELEMENTS, CONSCIOUS. One of the principal problems of psychology is to analyze into their simplest constituent processes the mental complexes (perceptions, ideas, emotions, actions) that occur in every-day experience. These simplest, unanalyzable processes are termed the 'elements of consciousness.' See CONSCIOUSNESS.

We must, first of all, get a clear understanding of the elements of mind. (1) There is practically universal agreement among experimental psychologists that the structural elements of mind are two — sensation and affection (see these terms). All intellectual experiences reduce to sensation; all emotional and volitional experiences are compounds of sensation and affection. The mental organism is, so to speak, made up of these two types of process, as the bodily organism is made up, from the anatomical standpoint, of certain forms of cells. Both elements are determined by analysis and abstraction; neither occurs alone in conscious experience. In the case of affection, the final court of appeal is introspection; that is simple which self-observation declares to be simple. In the case of sensation there are two possibilities of decision. We may regard sensation (a) as a psychological ultimate, or (b) as a psychophysical ultimate. (See PSYCHOPHYSICS.) Thus, the color 'red' and the temperature quality 'hot' are unanalyzable in introspection; they are psychological sensations. But in psychophysics red is the resultant of a chromatic (red) and an achromatic (white or gray) excitatory process, and hot is aroused by simultaneous stimulation of both warm and cold 'spots' upon the skin. Psychophysically, therefore, the color and the heat are fusion qualities—perceptions, not sensations. It is immaterial which of the two 'ultimates' we take as the basis of our reconstruction of mind from the elements; but we must be careful not to confuse them. (2) Psychologists, again, are fairly well agreed upon the question of the principal mental functions, though they differ as to which of these should be considered elemental. Brentano posits three ultimate functions—presentation or ideation, judgment or belief, and interest or emotion (love and hate). Stout recognizes cognition (including, as integral constituents, sentience, simple apprehension, and belief) and volition; this latter includes the fundamentally distinct functions of feeling (being pleased and displeased) and conation (desire and aversion). Wundt, on the other hand, regards impulse, a volitional process compounded structurally of sensation and affection, as the one typical form of mental function from which all the rest are derivative. (3) Impulse is further, for Wundt, the primordial manifestation of mind. This view is, of course, not shared by those who regard the reflex movement as primitive, and believe that mind has in some way been superinduced upon unconscious bodily activity. See ACTION.

Consult: Stout, *Analytic Psychology* (London. 1896); Brentano, *Psychologie* (Leipzig, 1874); Wundt, *Outlines of Psychology* (Eng. trans. Leipzig, 1902); id., ***Physiologische Psychologie*** (Leipzig, 1902-3).

ELEMENTS, ELECTRO-CHEMICAL ORDER OF. See ELECTRO-CHEMISTRY, GENERAL; CHEMISTRY.

ELEMENTS, SACRAMENTAL. See LORD'S SUPPER.

ELEMI, ĕl′ē-mī (Fr. *élémi*, of doubtful etymology). A fragrant resinous substance, obtained from different plants of the order Burseraceæ. It was formerly brought chiefly from

Egypt or Ethiopia, and was referred to a tree called *Amyris plumieri*. Part of the elemi of commerce is now obtained in America, from trees of other genera of the same natural order, particularly *Protium icicariba*. In dry weather, incisions are made in the bark, from which the resinous juice flows abundantly, hardens in the sun, and becomes brittle with age. Mexican or Vera Cruz elemi is derived from several species of Bursera. Manila elemi is produced by *Canarium commune*. Elemi is seen in the trade usually in large, pale-yellow, semi-transparent masses; fragile, softening by the heat of the hand; with a smell somewhat resembling that of fennel. It is soluble in alcohol and leaves a white crystallizable residue, which is very light, inodorous, and tasteless, and which is called elemine. The properties of elemi, however, chiefly depend on a volatile oil, which may be obtained from it by distillation. Elemi is used in the preparation of stimulant plasters and ointments, and is extensively used as an incense in Eastern countries.

ELEOLITE. A common massive variety of nephelite (q.v.) sometimes occurring in large coarse crystals. It has a greasy lustre and is reddish, greenish, or gray in color.

ELEPHANT (AS. *elpend*, OF. *olifant*, *elifant*, Lat. *elephas*, from Gk. *ἐλέφας*, possibly from *ἐλ-*, *el*, Arm. *eγ*, horn + *-εφας*, *-ephas*, Lat. *ebur*, ivory, from Egypt. *abu*, *ab*, Copt. *edou*, *ebu*, elephant). An ungulated mammal of the suborder Proboscidea and family Elephantidæ, representing by two species the largest existing land animals. The ordinary height at the shoulder is about 8 feet, but occasionally exceeds 10 feet, and has been known in one case, in Ceylon, to reach 12 feet. The weight of a large elephant is about five tons, the body being very bulky in proportion to its height. To sustain this weight, it is furnished with limbs of colossal thickness and strength, which are also remarkably straight, each bone resting vertically on that beneath it. In lying down, the elephant does not bring his hind legs under him, like other quadrupeds, but extends them backward as a man does when kneeling. The elephant's pace, when exceeding a walk, is neither a trot nor a gallop, but a sort of shuffle, the speed of which is increased or diminished without change of gait.

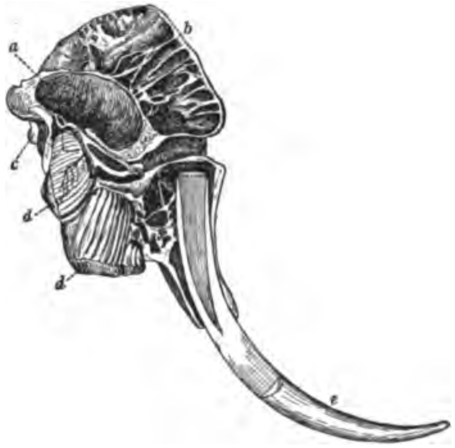


FIG. 1. SKULL OF AN INDIAN ELEPHANT.

Vertical section of the skull, with the molars and incisor (tusk) of one side: *a*, brain-cavity; *b*, cavernous upper part of the cranium, showing its cellular cavities; *c*, condyle; *d*, *d*, molars; *e*, tusk.

STRUCTURE. The head in elephants is large; the neck is short and thick, the long flexible proboscis enabling the animal readily to reach objects on the ground or at a height or distance of several feet. A great extent of bony surface in the head affords attachment for muscles destined to move and give power to the proboscis or trunk, yet the head is light in proportion to its bulk, as a great space separates the internal and external tables of all the bones of the skull, except the occipital bones, so that the brain-chamber is but a small part of the whole head. The space between the tables of the bones is occupied by cells, some of which are 4 or 5 inches in length, which connect with each other and are filled with air, making the vast skull comparatively light.

TRUNK. The nasal bones of the elephant are scarcely more than rudimentary; but the tapering proboscis, to the very extremity of which the nostrils are prolonged, is nearly eight feet in length. Besides the great muscles connected with it at its base, it is composed of small muscles variously interlaced, which Cuvier estimated at not much less than 40,000. The trunk can be coiled around a tree, and employed to tear it from its roots; it is a formidable weapon of offense and defense, and is far more employed in this way than the tusks. Its extremity may be wound around a small handful of grass or a slender branch, and it is capable of picking a surprisingly small object from the ground. To fit it for such actions as a man might perform by a hand, the trunk of the Indian elephant is furnished at the extremity with what may be likened to a finger and thumb; on the upper side, an elongated process, soft, strong, flexible, and endowed with the most delicate sense of touch; on the under side, a kind of tubercle against which this process may be pressed. All the food of the elephant is gathered and conveyed to the mouth by the trunk; by means of the trunk, also, it drinks, sucking up a quantity of water sufficient to fill it, and then discharging the contents into the mouth. Valves at the base of the trunk prevent the water from going too far up the nostrils. The trunk is constantly employed by elephants in providing in many ways for their comfort and enjoyment, as in throwing dust or spouting water over their backs, two practices to which they are greatly addicted. Their friendly caresses are also given by the trunk, and through it they make a loud shrill sound, indicative of rage. With the trunk, also, they are able to strike powerful blows.

The sense of smell is very acute in the elephant, as is also that of hearing. The ears are large and pendulous; the eyes are small.

TEETH. Elephants have no canine teeth, nor have they any incisors in the lower jaw. The upper jaw is furnished with two incisors which, in perfection, become enormous tusks, sometimes weighing from 150 to 200 pounds. They are preceded by milk-teeth, shed at an early age, and they consist almost wholly of solid dentine, the fine elastic quality of which renders it invaluable as ivory (q.v.) for various uses in the arts. A peculiarity of its structure is that in a cross-section "striæ proceed in the arc of a circle from the centre to the circumference in opposite directions, . . . as in the engine-turning of a watch." The tusks vary greatly in size, being sometimes very small, and they are often malformed or wholly broken off. Elephants employ them for such uses as grubbing up edible roots, or loosening the roots of trees which they cannot otherwise tear from the ground; as weapons (by thrusting), especially in maintaining discipline in a herd; and in domestication for carrying light sticks of timber, held in place by the trunk. The molar teeth of the elephant are developed in succession; and, at least in the Indian elephant, never more than two are to be seen in the same side of a jaw at one time. The first molars cut the gum in about two weeks after birth, and are shed about the end of its second year. The sixth molars, which are also believed to be the last, are supposed to appear about the fiftieth year of the elephant's life. The molar teeth of the elephant are remarkable for their great size, and for the extreme complexity of their structure. They are composed of vertical plates of bony substance, separately enveloped in enamel and soldered together by a third substance, 'cement,' more resembling bone than enamel. Each succeeding tooth is not only more complex, but occupies a greater space in the jaw than its predecessor. Although formed from a single pulp, the molar tooth of an elephant resembles an aggregation of teeth; and in the earlier stages of its growth, when the cement is not yet deposited, it seems as if many separate teeth were soldered together. As the surface of the tooth is worn down by mastication, the harder enamel is exposed in elevated ridges; from the peculiar manner of its growth, the anterior part begins to be employed, and to be worn away, while the latter part is still in process of formation.

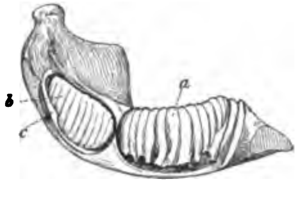


FIG. 2. MOLAR TEETH.

a, penultimate molar; *b*, germ of the last molar; *c*, bony capsule of the alveolus, which moves forward with the tooth.

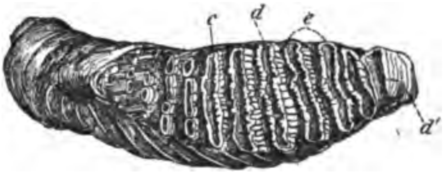


FIG. 3. MOLAR OF INDIAN ELEPHANT.

d, dentine; *d'*, dentine worn down to common base; *e*, enamel; *c*, cement.

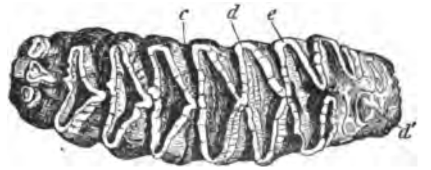


FIG. 4. MOLAR OF AFRICAN ELEPHANT.

Grinding surface of the penultimate lower molar. Letters as in Fig 3.

FUNCTIONS. The digestive apparatus of the elephant is similar to that of other herbivorous animals; but the stomach, which is of a very lengthened and narrow form, has near the gullet a reservoir for water, capable of containing several gallons, while a peculiar muscle, connecting the windpipe and gullet, enables the animal to regurgitate the fluid, which may then be sucked from the mouth into the trunk, and squirted over the body, or at some offending man or animal.

The female elephant has only two teats, situated between the fore legs. The young suck with the mouth and not with the trunk. They are suckled for about two years. The period of gestation is also nearly two years, and a single young one is produced at a birth.

The skin of the elephant is very thick, of a dark brown color, and in the existing species has scarcely any covering of hair. The tail does not reach to the ground, and has a tuft of coarse bristles at the end. The feet have toes, each incased in a kind of hoof.

HABITS, ETC. Elephants live in herds, not generally numerous, but several herds often congregate together in the same forest or at the same place of drinking. Each herd has a leader, generally the largest and most powerful animal. The leader seems to exercise much control over the herd, gives the alarm in case of danger, and seems to examine and decide for the whole herd as to the safety of proceeding in any particular direction. A family resemblance is usually visible among the elephants of the same herd; some herds are distinguished by greater stature, and others by more bulky form and stronger limbs; some by particularly large tusks, some by slight peculiarities of the trunk, etc. In the East Indies, distinctions of this kind have long been carefully noticed, and some are considered as 'high-caste,' others as 'low-caste' elephants. An elephant which by any cause has been separated from its herd seems never to be admitted into another, and these solitary males are particularly troublesome in their depredations, exhibiting an audacity which the herds never show; they are also savage and much dreaded, while from a herd of elephants danger is rarely apprehended. These remarks apply especially to the Asiatic species.

The favorite haunts of the African elephant are mountainous districts with a scattered tree-growth; but the Asiatic species keeps itself in the depths of forests, particularly in mountainous regions, where they browse on branches or eat herbage, roots, etc., and from which they issue chiefly in the cool of the night to pasture in the more open grounds. They feed largely on the young shoots of palm-trees, and crush and eat the cocoanuts, after rolling each one under foot to rub off the husk; and they often do vast damage to crops.

Elephants delight in abundance of water, and enter it very freely, often remaining in it for a considerable time and with great evident enjoyment, swimming with ease and skill.

Two species of elephant only survive the decay of a family much more numerous and widespread in the geological period that preceded the present, one African and the other Asiatic. For fossil and extinct species, see section *Fossil Elephants*, and see also MAMMOTH; MASTODON.

African Elephant. This species (*Elephas Africanus*) is confined to Africa, and until the settlement of South and East Africa during the last half of the nineteenth century it ranged over every part of the continent south of the Sahara and Nile deserts, in surprising abundance. It disappeared south of the Zambezi and from near the coast as the century closed, but throughout the equatorial regions it is still numerous and is likely to remain in fair numbers, as European governments have agreed upon various laws, including a close season for females, and an export duty on the tusks, by which it is hoped to prevent rapid extermination. This species is frequently 10 feet in height, the males surpassing the average height of the Asiatic species, but the females are smaller. Both sexes have tusks, a fact which contributes to the diminution of the species, as the females are as liable as the males to be killed for the sake of their ivory. The crowns of the molar teeth exhibit a lozenge pattern of grinding surfaces and the teeth differ in structure from those of the Indian elephant. There are but three toes on the hind feet.

This elephant was familiar to the ancient Egyptians, and is believed to have been used by them in war at an early period. Those which Hannibal took with him upon his famous expedition against Rome are presumed, rather than known, to have been of this kind, but possibly were Asiatic. At any rate African elephants were never, or very rarely, seen in Europe from the show days of Imperial Rome until about 1860, since which perhaps 100 have been taken there alive, nearly all of which soon died of disease. There seems to be no reason why the African elephant may not be tamed and educated as well as the Asiatic species. That the African savages, who frequently might capture calves, do not rear them is to be explained not only by the animal's uselessness to them, but by the impossibility, in the case of most tribes, of keeping the calf alive until it is able to quit a milk diet and live upon grass and leaves. This elephant, then, is of service to mankind only as the source of nearly all the living ivory that comes to the market.

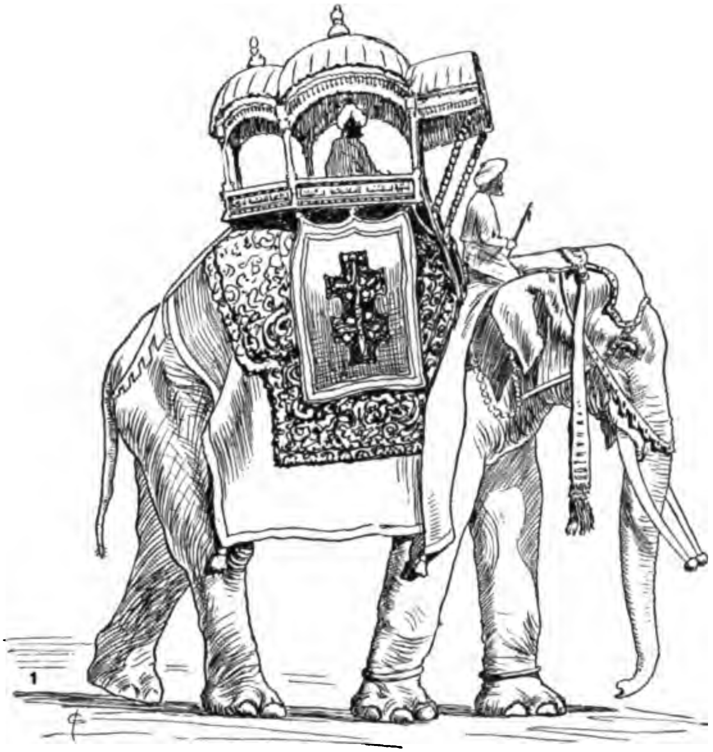
Asiatic Elephant. The more familiar Indian elephant is prominently distinguished from the African by having a rather high, oblong head with a concave forehead, ears hardly more than half as large, and the eye smaller. Tusks are present only in the males and are only about half as large or heavy as African tusks; and the molar teeth are different. There are four and sometimes five toes on the hind feet, and the trunk terminates in the flexible finger-like prolongation already described. The height of the average male is about 9 feet, and of the average female about 8 feet, weighing from 2 to 3 tons; but specimens exceeding 10 feet in height are not very rare. They become fully grown at the age of twenty-five, but their teeth do not show complete maturity until some years later. Several captive specimens have been known to live a century, and it seems likely that in a wild state they may sometimes reach an age of 150 years. Their distribution is somewhat less extensive than formerly, but the species ranges at the present day through the forested regions from Ceylon, the western Ghats, and Himalayan foothills eastward to Cochin China and southward to Sumatra and Borneo; but Blanford believes that their presence in Borneo may be due to human agency. They keep to the shady forests, rarely showing themselves in the open except at night or on cloudy or rainy days, for they soon feel great distress from exposure to the sun.

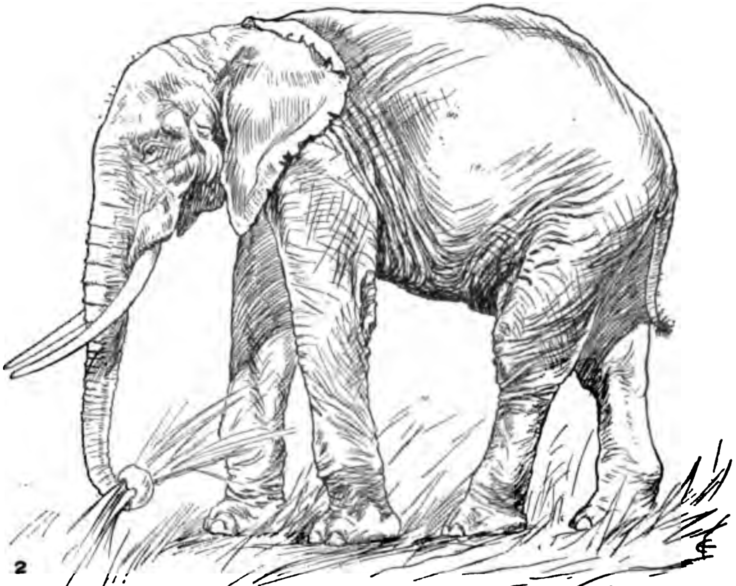
Elephants breed not rarely in a state of domestication, although where owned for breeding purposes, as in Siam, the studs are kept up by the capture and addition of new individuals. They are generally tamed within a few months after they are captured; some degree of severity being employed at first, which, however, as soon as the animal has begun to respect the power of man, is exchanged for kindness and gentleness of treatment. Elephants intended for domestication are captured in various ways. It was formerly common to take them in pitfalls, but in this way they were often much injured. Another method frequently practiced is by the aid of tame elephants. Male elephants chiefly are captured in this way, the decoy elephants employed being females, trained for the purpose. With these the hunters very cautiously approach the animal they mean to capture. Two of the females take their places, one on each side of him, while the men contrive to get beneath their bodies, and to pass ropes round the legs of the intended captive. His two hind legs are fastened together by six or eight ropes, another rope keeping them tight at the intersections, and a strong cable with a running noose is attached to each hind leg. About twenty minutes are usually spent in fixing the necessary ropes, profound silence being maintained if the process goes on unobserved, or some of the other hunters distracting the attention of the elephant from those who are engaged in this work; and when at last, becoming sensible of his danger, he tries to retreat, an opportunity is soon found of tying him, by means of the long cables which trail behind him, to some tree strong enough for the purpose. His fury then becomes ungovernable, and it is not until he has thoroughly exhausted himself, and begins to suffer severely from fatigue, thirst, and hunger, that the next steps are taken toward taming him.

But these huge animals are not always captured singly; whole herds are often taken at once. This is accomplished by means of an inclosure, toward which the elephants are driven by great numbers of men encircling a considerable space, and contracting the circle by slow degrees. Weeks, or even months, are spent in this operation, and at last the elephants, hemmed in on every side except the mouth of the inclosure, enter it, and the gate is immediately closed. The modes of constructing the inclosure are different in different parts of the East. Tame elephants are sometimes sent into it, and the captives are in succession made fast to trees there, in a way somewhat similar to that practiced in capturing single elephants.

These elephants first became known in Europe from their employment in the wars of the East. They have been taught to cut and thrust with a kind of scimitar carried in the trunk, and it was formerly usual for them to be sent into battle, covered with armor, and bearing towers on their backs, which contained warriors. But the principal use of the elephant in war is for carrying baggage and for dragging guns. Elephants are used in the East for carrying persons on their backs, a number being seated together in a

ELEPHANTS





1. INDIAN ELEPHANT (Elephas Indicus), with howdah and trappings.

2. AFRICAN ELEPHANT (Elephas Africanus).

'howdah,' while the driver (mahout) sits on the elephant's neck, directing it by his voice and by a small goad. Elephants have always a conspicuous place in the great processions and state displays of Eastern princes, and white elephants —albinos—are peculiarly valued. Elephants are also employed in many kinds of labor, and display great sagacity in comprehending the nature of their task and adapting themselves to it.

FOSSIL ELEPHANTS. The ancestry of the elephants, or Proboscidea, is not well known. They are the least specialized of the modern ungulates, for during their known history they have progressed only in respect of the development of the trunk or proboscis, the substitution of tusks for the incisor teeth, and the acquirement of an abnormal molar dentition. In the early Miocene time they appeared with their proboscidean characters quite well developed, and the chief genera, Dinotherium, Mastodon, and Elephas, which succeed each other in geologic time, present a progressive evolutional series. In the earlier forms the bony structure of the facial region of the skull is less thickened than it is in later forms, indicating a lesser muscular attachment for a smaller proboscis. The tusks augment in size in the successive genera, and the teeth increase in complexity as to their crowns. The molar teeth of Dinotherium have only two or three transverse ridges, Mastodon has 2 to 5, Stegodon has 13, and Elephas has 27. This complexity is due to folding of the enamel into transverse ridges, the number of folds advancing in the successive genera. The size of the molars also increases, and in the latest genus, Elephas, they have become so large that only two or three can be in position in the jaw at one time. The brunt of the chewing falls upon the anterior molar, and as this is worn out it is pushed forward out of the front of the jaw, and the space behind is filled by a new molar that rises from a socket at the back of the jaw. Fossil Proboscidea appear in the Miocene and Pliocene of North America and Europe and in the Pliocene of South America, but at the end of the Pleistocene they disappeared from those countries, having emigrated to Asia and Africa, where their descendants are now living. Consult: Woodward, *Outlines of Vertebrate Paleontology* (Cambridge, 1898); Bernard, *Eléments de paléontologie* (Paris, 1895); Nicholson and Lydekker, *Manual of Paleontology*, vol. ii. (Edinburgh and London, 1889). See DINOTHERIUM; MAMMOTH; MASTODON.

BIBLIOGRAPHY. Of the older sources of information, the best are the article in Jardine's *Naturalist's Library* (London, 1833-43) and Andersson's book, *The Lion and the Elephant* (London, 1873). For the Asiatic elephant, consult: Tennent, *The Wild Elephant in Ceylon* (London, 1867); Hornaday, *Two Years in the Jungle* (New York, 1885); Sanderson, *Wild Beasts of India* (London, 1893), the last-named of which is, on the whole, the best authority on the subject; also Kipling, *Beasts and Man in India* (London, 1891); Mury, *Les éléphants en Siam et en Cambodge* (Paris, 1900); Pollok, *Sport in British Burma* (London, 1879), and the writings of sportsmen-travelers, especially D'Ewes, Forsyth, Shakespeare, Baldwin, and Barras. For the African elephant, consult: Neumann, *Elephant Hunting in East Equatorial Africa* (London, 1898); Gordon-Cumming, *Five Years of a Hunter's Life in South Africa* (New York, 1850); Harris, *Game and Wild Animals of Southern Africa* (London, 1840); Baker, *Wild Beasts and Their Ways* (London, 1890), and other books by the same writer; Holub, *Seven Years in South Africa*, translated by Frewen (London, 1881); Selous, *A Hunter's Wanderings in Africa* (London, 1890), and other books by Selous; Armandi, *Histoire militaire des éléphants* (Paris, 1843); Balan, *Der Elephant in Krieg und Frieden, und seine Verwendung in unsern afrikanischen Kolonien* (Hamburg, 1887).

ELEPHANT, ORDER OF THE. A Danish Order of uncertain origin. It dates back, acording to some authorities, to Canute VI. in the twelfth century, and according to others to Christian I. in the second half of the fifteenth. The decoration is highly valued, because rarely conferred. The badge is a white enameled elephant, caparisoned in blue, with a red tower on its back and a negro driver. The collar consists of alternate towers and elephants. The ribbon is blue.

EL'EPHAN'TA (locally, *Gharapuri*). An island four miles in circuit, in the harbor of Bombay, East India, about six miles to the east of that city (Map: India, E 6). It took its European name from the huge figure of an elephant, cut out of a detached rock, near its principal landing-place, which, however, has gradually crumbled away. Close by are three temples dug out of the mountain, the roofs supported by curiously wrought pillars of various forms and magnitudes, and the walls thickly sculptured into all the forms of Hindu mythology. The largest of the three excavations is nearly square, measuring 133 feet by 130½ feet; immediately fronting its main entrance stands a bust, or third-length of a three-headed deity, with a height of 18 feet and a breadth of 23, representing the Siva trinity of creation, preservation, and destruction. The great temple is used by the Baniya caste for the Sivaite festivals. Consult: Burgess, *The Rock Temples of Elephanta* (Bombay, 1871), and Ferguson and Burgess, *The Cave Temples of India* (London, 1880).

ELEPHANT BEETLE. A gigantic lamellicorn beetle (*Megasoma elephas*) of Central America. Its total length is about five inches, two-fifths of which belongs to a strong, upturned forked horn projecting from the head. The ground color of the whole insect is black; but, with the exception of the front horn, the entire surface is thickly covered with dense, soft, upright, yellowish fur. As this fur is easily rubbed off, most

THE ELEPHANT BEETLE.

specimens are partly bare. Another species, *Megasoma acteon*, of Nicaragua, is as large or larger, and its fur varies from chestnut on the horn to yellow on the elytra.

ELEPHANT FISH or **SHARK**. A name for the chimæra (q.v.).

EL'EPHANTI'ASIS (Lat., from Gk. *ἐλεφαντίασις*, from *ἐλέφας*, *elephas*, elephant, so called because the skin becomes wrinkled like the hide of an elephant). A medical term applied to any marked hypertrophy of the skin and areolar tissues, though generally used to designate a disease accompanied by œdema and progressive hypertrophy of the cutaneous and areolar tissues. There are two diseases called by the name. One is the elephantiasis of the Greeks, which is regarded as the same as the Eastern leprosy and as the *spedalskhed* of Norway, and the chief features of which are described in the article LEPROSY. In this affection the size of the limbs and the state of the epidermis are comparatively slightly altered. The other is the elephantiasis of the Arabs, identical with the *Barbados leg* (q.v.) of the East and West Indies and the Levant, where it is endemic. After headache, fever, nausea, and vomiting, the leg, or arm, or scrotum becomes inflamed, swollen, and tender; bullæ may form and burst, exuding serum. In a few hours or a few days the attack ends. But others follow, and the affected part becomes larger and larger, each attack leaving it greater in size. The scalp, face, or female genitals may become enlarged, as well as any part of the body; but the leg is the most often affected. Manson, in 1883, established the fact that endemic elephantiasis is due to the presence in the lymphatics of a parasitic worm called filaria (q.v.). Turner, of Samoan experience, believes some cases are due to malarial infection. Rest in bed, with elevation of the affected part, elastic bandaging, massage, galvanism, palliate some cases; change of climate and quinine cure a few; amputation may be necessary in some instances.

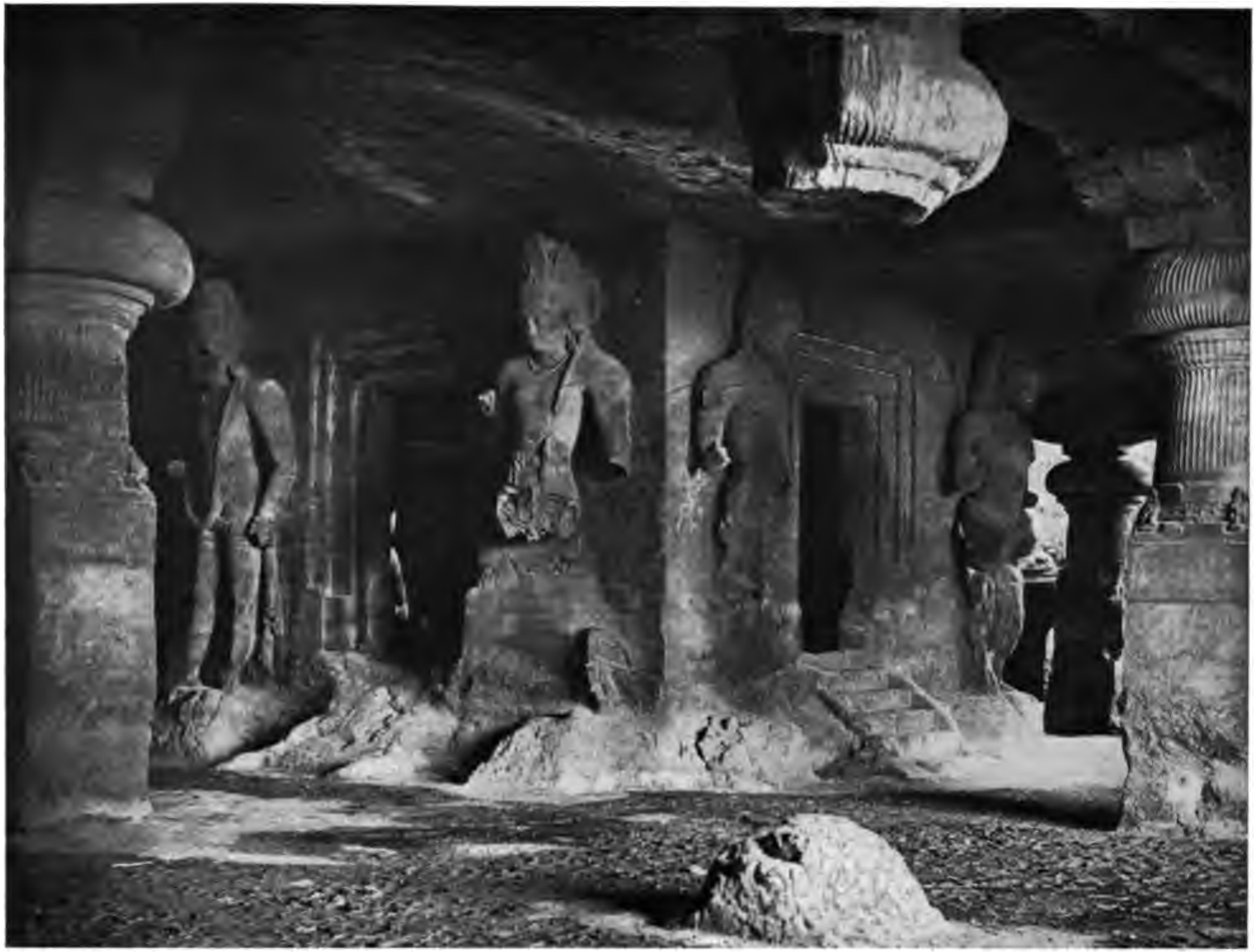
EL'EPHANTI'NE (Lat., from Gk. Ἐλεφαντίνη). The Greek name of an island in the Nile, just below the first cataract and opposite Assuan (q.v.), the ancient Syene. From very ancient times the island was a trading-post whither the Nubians brought ivory and other wares for barter with the Egyptians; from this circumstance it derives its Egyptian name, *'Abu*, 'ivory town,' of which the Greek name is a translation. It is called by the Arabs *Jezîrat Aswân*, 'the island of Assuan,' or simply El-Jezîreh, 'the island.' The whole southern end of the island is covered with rubbish-heaps which have accumulated over the ruins of the ancient city. Near by are the foundations of a small temple built by the Emperor Trajan, and a granite gateway on which are sculptures representing Alexander, son of Alexander the Great, making offerings to the gods of Elephantine, and especially to the ram-headed god Knum. Farther north stood a temple built by Amenophis III., and another built by Thothmes III. Both existed in a fine state of preservation until 1822, when they were demolished for the sake of the building material they contained. The most interesting relic remaining upon the island is the Nilometer (q.v.), of which a description is given by Strabo. It was restored and placed in use in 1870 by the Khedive Ismail Pasha. Consult: Champollion, *Notices descriptives* (Paris, 1844); Mariette, *Monuments of Upper Egypt* (London, 1887); Edwards, *A Thousand Miles Up the Nile* (London, 1888).

ELEPHANT SEAL, or **SEA-ELEPHANT**. The largest species (*Macrorhinus leoninus*) of the hair-seal family Phocidæ, an inhabitant of the seas of the Southern Hemisphere. It is considerably larger than an elephant, being sometimes more than 20 feet in length, with a circumference of about 12 feet at the thickest part, which is at the chest, immediately behind the fore flippers; the body tapers toward the tail. The females are only one-half or one-third the bulk of the males. The color is grayish or blackish brown. The whole body is covered with very short hair, distributed in patches, giving it a spotted appearance somewhat like watered silk. The head is larger in proportion than in many seals; the eyes are very large and prominent, with eyebrows of coarse hair; the whiskers are composed of very long and coarse spirally twisted hairs; there are no external ears; the canine teeth form massive tusks. The nose of the males is very remarkable, being prolonged into a kind of proboscis about a foot in length, which, however, seems to serve no purpose whatever analogous to that of an elephant's trunk, but ordinarily hangs flaccid on the face. During the breeding season the males have furious combats, the victor winning for himself a whole herd of females. When the proboscis is dilated the voice of the sea-elephant, which usually is like the lowing of an ox, is completely changed, and becomes a loud and extraordinary gurgling. See Colored Plate of SEALS.

Sea-elephants were to be found, at the beginning of the nineteenth century, in immense herds on the coasts of Kerguelen's Land, Juan Fernandez, South Georgia, the States Islands, South Shetland, the Falkland Islands, and the southern extremity of South America; but their numbers have been greatly reduced, and they are practically extinct in the region about Cape Horn and other easily accessible haunts. They migrate southward at the beginning of summer, and northward at the approach of winter, thus avoiding the extremes of heat and cold. A single individual sometimes yields 20 gallons of excellent oil, which burns slowly, with a clear flame and without smoke or disagreeable odor. For this oil these animals have been hunted until now they are much reduced in numbers. Cuttlefish and other cephalopods seem to be their principal food; but remains of marine plants have also been found in the stomach. The skin is not at all valued on account of its fur, but its thickness and strength make it very useful for harness-making and similar purposes. The flesh is black, oily, and indigestible, the tongue alone (salted) being esteemed palatable.

An allied species, the northern sea-elephant (*Macrorhinus angustirostris*), was formerly common on the coasts of Lower California, but is now practically extinct. It differed very little from the southern species.

Early descriptions of the elephant seal, in the voyages of Cook, Peron, Anson, and others, were tinged with much romance. A good modern and critical account of the animals, as observed on Kerguelen and neighboring islands, will be found in Moseley, *Notes by a Naturalist on the Challenger* (London, 1879). For the history and characteristics of the Californian species, consult Scammon, in *Fishery Industries* (United States



ELEPHANTA

TEMPLES OF ELEPHANTA, BOMBAY HARBOR, INDIA

Fish Commission, Washington, 1884), where further references will be found.

ELEPHANT'S-EAR. The popular name of Colocasia esculenta, or, as it is known to the trade, Caladium esculentum, a Hawaiian or Fiji plant with very large, bright-green leaves, used to give sub-tropical effect in bedding. The rootstock is planted in good, moist soil out of doors, or started in a hotbed or greenhouse and transplanted. In autumn it is stored where dampness and frost cannot reach it.

ELEPHANT SHREW. An African shrew of the genus Macroscelides, so called on acount of its proboscis-like nose, especially Macroscelides typicus of Cape Colony, and a very similar species (Macroscelides Rozeti) of the Mediterranean border, known in Algeria as 'rat-à-trompe.' See Jumping Shrew.

ELEPHANT TORTOISE. The giant land tortoise of the Galapagos Islands. See Tortoise and Extinct Animals.

ELETZ, *ye*-lĕts'. See Yeletz.

ELEUSINE, el'yû-sī'nê (Neo-Lat., from Gk. Ἐλευσίς, *Elcusis*, a city of ancient Greece). A genus of grasses, most of which are annuals. Two of the species—*Eleusine corocana* and *Eleusine stricta*, generally called millets—are grown as grain crops in the warmer parts of Asia and in Africa. A sort of bread is made from the seed, but it has a rather bitter taste. A kind of beer is also brewed from it. The grasses are of rapid growth, and are very productive in both grain and forage. *Eleusine indica* is a well-known species in the United States, especially in the South, where it is known as goose-grass and is considered a pest. Infusions of the seeds and other parts have some reputation as domestic remedies for certain ailments. Popular names for this grass are goose-grass and crab-grass.

EL'EUSIN'IAN MYSTERIES (translation of Gk. Ἐλευσίνια μυστήρια, *Eleusinia mystēria*). The sacred rites with which the annual festival of Demeter was celebrated at Eleusis. The early Eleusinian tradition of their origin is preserved in the Homeric Hymn to Demeter. According to this, the goddess, while wandering in search of Persephone, came to Eleusis in disguise, and was hospitably received by King Celeus. In return she directed the establishment of a temple and mystic rites in her honor, and showed to Triptolemus and other princes the use of grain. Later these rites seem to have been largely influenced by the Orphic movement of the sixth century B.C., to which may be attributed the introduction of Iacchus into the triad of Demeter, Kore, and Triptolemus, who seem to have been the earlier divinities. For the nature and celebration of this worship, see Mysteries; for the sanctuary, see Eleusis.

ELEU'SIS (Lat., from Gk. Ἐλευσίς, properly place of resort, from ἔλευσις, *eleusis*, a going, ἐλεύσεσθαι, *eleusesthai*, to be about to go). A town in Attica, near the northern shore of the Gulf of Salamis, not far from the confines of Megaris. It was the chief seat of the worship of Demeter, and the scene of the celebration of the Eleusinian mysteries. (See Mysteries.) The town was very ancient, and in early times a rival of Athens, against whose supremacy in Attica it long held out, and finally submitted on terms which left it two priestly families—the Eumolpidæ and Ceryces—in control of the sanctuary and its rites, though in later times the State controlled the revenues of the temple. Until 1882 excavations on this site had been few and unremunerative; but in that year the Greek Government expropriated the site of the sanctuary, and the Greek Archæological Society began a series of excavations which have laid bare the entire sacred precinct. The temple of the two goddesses—Demeter and Kore—has disappeared, and even its site is uncertain; but the two Propylæa erected in Roman times, the Sacred Well, where Demeter rested, lesser temples, a Bouleuterion, or council hall, and the great terrace on which stood the Telesterion in which the mysteries were celebrated, can be plainly traced. Before the Persian War the Great Hall was a rather small building at the foot of the rocky hill which formed the ancient Acropolis. After the war this structure was enlarged by cutting back into the rock, and in the time of Pericles still further enlarged by building alongside another hall of about the same size. Probably these two halls had a common upper story, for both contain many large columns which must have been needed to sustain a heavy weight. In the fourth century B.C. the architect Philon of Eleusis added a great portico to the common front of these halls, and in Roman times, probably under Hadrian, the two buildings were thrown into one great hall with forty-two interior columns (seven rows of six columns each), and a series of raised steps around the sides. Probably both lower and upper stories were used in the celebration of the mysteries. The modern name for the little village on this site is Levsina. Consult: Gardner, *New Chapters in Greek History* (London, 1892); Diehl, *Excursions in Greece* (London, 1893); Philios, *Eleusis* (French, Athens, 1896); Frazer, *Pausanias* (London, 1898). The reports of the excavations are to be found in the Πρακτικά, of the Greek Archæological Society, and the Ἐφημερὶς Ἀρχαιολογική; they are summarized in the excellent guidebook by Philios, who directed the work for many years.

ELEUTHERA, ê-lū'thê-rȧ. One of the Bahamas (q.v.), British West Indies, lying to the east of Nassau, and next to New Providence the most populous island of the whole chain (Map: West Indies, K 2). Area, 164 square miles. It is more fertile than most of its neighbors, surpassing all of them in the growth of fruit, such as the pineapple, the orange, and the lemon. It has a population (1901) of 8733. The chief town is Governor's Harbor, with a fort and a good harbor.

ELEUTHERA BARK. See Cascarilla.

EL'EUTHE'RIA. See Greek Festivals.

ELEU'THERUS. Pope from 177 to 192. He is said to have received a letter from Lucius, King of Britain, asking that missionaries be sent to his country to teach the Christian religion. The letter is found in the *Liber Pontificalis*, and in Bede, *Historia Ecclesiastica*, iii., 25. It is generally thought to be a forgery.

ELEVATED RAILWAYS. See Railways, section *Elevated Railways*.

ELEVA'TION (Lat. *elevatio*, from *elevare*, to raise, from *e*, out + *levare*, to raise, from *levis*, light; connected with Lith. *lengwus*, Gk. ἐλαχύς, *clachys*, Skt. *laghu*, *raghu*, light). In astronomy, the height above the horizon of an object on the celestial sphere, measured by the arc of a vertical circle passing through the object. Thus, the elevation of the equator is an arc of the meridian intercepted between the equator and the horizon of the place. The elevation of the pole is the meridian arc intercepted between the horizon and the celestial pole. It is the complement of the equator's elevation, and is always equal to the latitude of the place. The elevation of a star or any other point is similarly its height above the horizon, and is a maximum when the star is on the meridian. See ALTITUDE.

The architecture and elevation is the geometrical representation of the exterior, or section of a building, which gives an appearance as if it were viewed from such a distance that no convergence of lines would be seen. Technically speaking, the elevation of a building is its vertical right-line projection. The elevation is one of the three drawings which are essential in designing any architectural structure, the others being the plan (q.v.) and the section (q.v.).

ELEVATION AND SUBSIDENCE. Terms applied to vertical movements of the earth's crust. The great movements of the earth's crust are ascribed to cumulative stresses induced probably by the shifting of rock material at the surface through the agencies of weathering and erosion. While local areas may be elevated—that is, carried farther from the centre of the earth—due to the efforts of rocks to relieve themselves from great lateral stresses by bulging out, it is held by most geologists that large areas are seldom actually elevated, but that uplift is only apparent because of the subsidence of adjacent areas. In other words, it is believed that all parts of the crust are subsiding, some, however, faster than others, thus giving the impression that the adjacent areas are rising. If the sea-bottom should subside, the water would flow away from the continental shores, and the continents would apparently rise, although in reality they might remain stationary. The great movements of uplift and subsidence are ordinarily considered in two great classes: (1) Epeirogenic movements, or vertical movements of large areas such as continents, or large parts of continents; (2) orogenic, or mountain-making movements—i.e. the movements which result in the folding and corrugation of the earth's crust into mountainous areas. See MOUNTAIN.

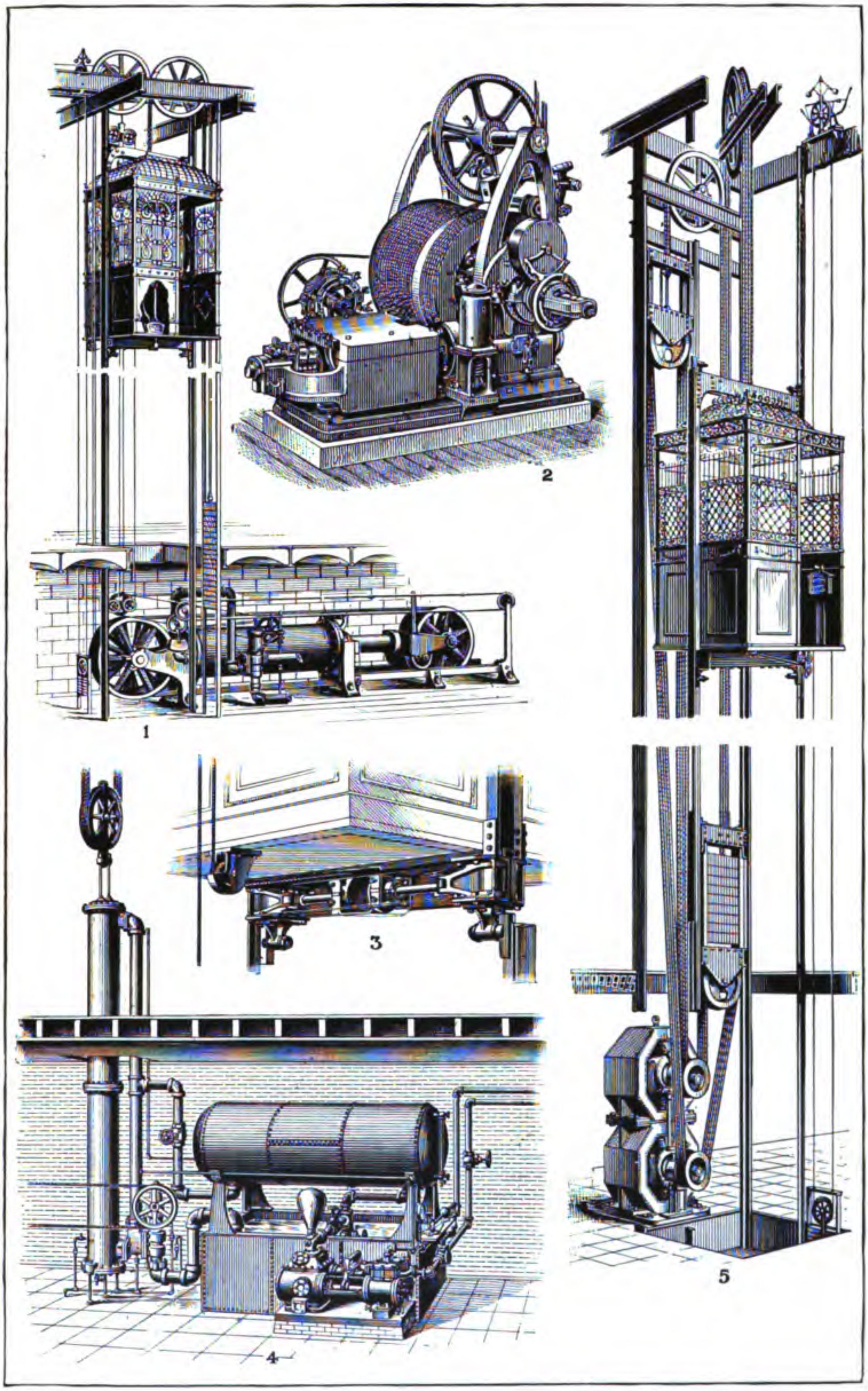
ELEVATION OF THE CROSS. The subject of two famous paintings, one by Rubens (1610), in the Antwerp Cathedral, the other by Van Dyck (1632), in Notre Dame, at Courtrai, Belgium. The former represents the bare cross being raised into position amid a throng; in the latter the Saviour has already been crucified, and the inclined beam is being supported and adjusted by four men, surrounded by the guard.

ELEVATOR (Lat. *elevator*, raiser, from *elevare*, to raise) or LIFT. A mechanical contrivance for transporting passengers or freight between points at different levels, such as the several stories of a building. The modern high-speed passenger elevator is usually operated by hydraulic or electric power, and it consists (1) of a rectangular car which moves up and down between guides in a shaft or well, with doors opening into each floor, and (2) of the mechanism necessary to give this car its up and down movement. Such elevators are usually designed to run at a maximum speed of from 600 to 800 feet per minute, but may be run at any less speed the operator may desire. Safety from accident is provided for in various ways. Broadly considered, modern elevator safety devices may be divided into two classes: (1) Clutch devices which are thrown into operation when the car exceeds a certain speed, and stop the car by seizing hold of or gripping guides fastened to the walls of the elevator shaft; and (2) air-cushion devices, whose purpose is to break the shock of a falling car so that injury will not result to its passengers. Elevator safety grips are of various forms, and the successful ones are nearly all owned or controlled by firms which build elevators.

The general principle upon which these devices operate is nearly the same, whatever their individual forms may be. A governor is placed on the elevator car or on the beam which supports the sheaves, whose speed varies with the speed of the car. When a certain speed is exceeded this governor actuates a mechanism which throws the clutch into operation, as is seen in the full-page illustration. The older and most commonly used form of air-cushion, invented by F. T. Ellithorpe, consists essentially of making the lower portion of the elevator shaft tight so that the car falling into it acts as a piston in a cylinder and is brought to a slow stop by the compression of the confined air. In one of the largest installations of this form of cushion, the closed shaft begins at the third story, and is 50 feet deep. The total travel of the car is 287 feet, which makes the ratio of the depth of the air-cushion to the distance of travel as 1 to 5.74. In a display test which was made with the cushion, a car weighing 2000 pounds was allowed to drop the total 287 feet, and it came to a complete stop without breaking eggs and electric-light bulbs which were placed on the floor of the car. A more recent form of air-cushion has the air-cushion at the top of the shaft. In this arrangement the car carries two grips, the jaws of which, in normal operation, encircle but slide loosely over two steel cables provided with buttons at intervals. These cables are attached at their tops to a yoke, which is carried by a piston-rod and piston working in a vertical steel cylinder placed on the roof of the shaft. Normally the piston is held at the top of the cylinder by a spring latch. When the car falls the governor first operates a clutch which opens this latch, and, secondly, it operates the grips which close on the button-ropes. This throws the weight of the car into the yoke and piston, which, sliding down in the cylinder, compresses the contained air and brings the car to a gradual stop. The safety device is the most important appurtenance of the elevator car; the car itself is of simple construction, consisting usually of a rectangular steel framework covered inside with a grillwork of metal and provided with a solid floor and roof attachments for the hoisting cable.

For high-speed passenger elevators the operating mechanism is usually hydraulic or electric. In hydraulic elevators the hoisting cables run from the top of the car to and over sheaves at the top of the shaft, and thence to the operating machinery in the basement of the building. In the basement the cables pass around alternately fixed and traveling sheaves, the latter being at-

ELEVATORS



1. HYDRAULIC ELEVATOR WITH HORIZONTAL CYLINDER AND PISTON.
2. ELECTRIC MOTOR FOR SMALL ELEVATOR.
3. SAFETY CLUTCH.
4. VERTICAL CYLINDER AND PISTON FOR HYDRAULIC ELEVATOR.
5. EXPRESS ELECTRIC ELEVATOR WITH DUPLEX MOTOR.

tached to the piston-rod of the hydraulic cylinder. To raise the car the pressure is turned into the cylinder and forces out the piston-rod, thus pulling the traveling sheaves away from the fixed sheaves. The hydraulic cylinder is often placed in a vertical position, and the traveling sheaves move up and down in the same shaft as the car. The operation may be illustrated by that of an ordinary hoisting-tackle in which a heavy load is raised a short distance by hauling in a comparatively long length of hoisting-rope with a pulling force much smaller than the weight of the load lifted. By a reverse of this operation a heavy load moving a short distance will hoist a light load through a long distance. This is exactly the operation performed by the arrangement of fixed and traveling sheaves of a hydraulic elevator plant. The operation of the most recent type of electric elevator is much similar to that just described for hydraulic elevators. As applied to the elevators of the thirty-story Park Row Building, in New York City, the electric-elevator mechanism was as shown in the accompanying diagram. Here it will be observed that a nut traveling on a screw operated by an electric motor gives the proper motion to the traveling sheaves. In many forms of electric elevator the motor operates a drum on which the hoisting-rope is wound and unwound to hoist and lower the car. If in this construction we substitute for the electric motor a steam-engine to operate the drum, we have the ordinary steam-elevator arrangement. The only other form of hydraulic elevator than those described has a vertical cylinder sunk in the ground with the piston-rod extending upward and the car supported directly on the piston-rod. This form of elevator is being used in some very tall buildings, notably the Trinity Building, New York, and is also the elevator best adapted for short lifts of very heavy loads.

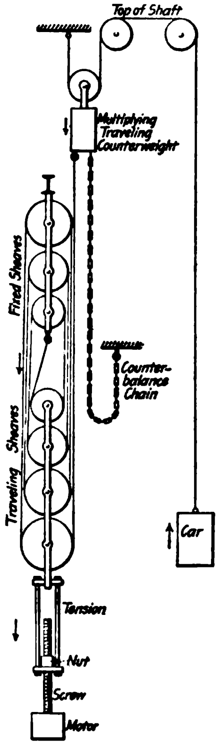


DIAGRAM OF ELECTRIC ELEVATOR.

The following figures indicate the nature and size of some recent elevator installations: Monadnock Block, Chicago, 16 hydraulic elevators, all of 16-stories travel; Saint Paul Building, New York, 6 hydraulic elevators, two 26-stories travel, two 16-stories travel, and two 9-stories travel; Bowling Green Buildings, New York, nine hydraulic elevators, 16-stories travel; Park Row Building, New York, 15 electric elevators, five 25-stories travel, five 26-stories travel, one freight elevator 26-stories travel, two tower elevators, and two sidewalk elevators. The Saint Paul Building plant is a good example of express elevator service. Two elevators in this building travel to the ninth floor, stopping at every floor; two travel to the sixteenth floor. passing every floor below the ninth without stops, or 'express,' and stopping at every floor from the ninth to the sixteenth, or 'local'; two travel to the twenty-fifth floor, running express to the sixteenth floor and local above the sixteenth floor. Among elevators designed to carry heavy loads may be mentioned those at the Weehawken, N. J., terminus of the North Hudson County Railway, which have a lift of 148 feet, with cars holding 140 persons each. The elevator in the Washington Monument, Washington, D. C., has a travel of 500 feet, and those of the Eiffel Tower (q.v.) have a travel of 450 feet. For grain elevators, see that title, and for elevators or hoists for tunneling and mining work, see TUNNELS and MINING.

ELEVEN THOUSAND VIRGINS, THE. See URSULA, SAINT.

EL-FASHER, ėl-fä′shẽr. The capital of Darfur (q.v.), Egyptian Sudan, Africa, situated in a well-watered valley east of the Marrah Mountains (Map: Africa, G 3). Owing to its position at the point where some of the most important caravan routes of northeastern Africa meet, the town is of considerable commercial importance. Its permanent population is estimated at 3000.

EL-FAYUM. See FAYUM.

ELF OWL. The smallest of American owls, and perhaps the smallest of all owls—*Micropallas Whitneyi*. It is little more than six inches in length, and is reddish gray above and white below barred irregularly with rufous brown. It dwells in and about Arizona, feeds mainly upon beetles and grasshoppers, and keeps itself in thickets or willow copses, nesting almost invariably in deserted woodpeckers' holes made in the giant cactus. Consult: Fisher, *Hawks and Owls of the United States* (Washington, 1893); and *The Auk*, vol. iii. (New York, 1886).

ELGAR, EDWARD WILLIAM (1857—). An English musician, born at Broadheath, near Worcester. He was educated at Littleton House and studied the violin and the organ. In 1882 he became conductor of the Worcester Instrumental Society, and in 1885 also accepted the position of organist at Saint George's. Both of these positions he gave up in 1889, and two years later began to devote himself entirely to composition. His works are universally popular in England and the United States, the most representative being: *The Black Knight* (cantata, 1892); *Lux Christi* (cantata, 1896); the oratorio *The Light of Life* (1896); *Choral Suite, from the Bavarian Highlands* (1895); *Te Deum* (1897); *Dream of Gerontius* (oratorio, 1900); a concert overture, *Cockaigne* (1901); *The Apostles* (1903).

EL-GHOR, ĕl-gôr′, WADI. The northern part of the great depression known as El-Araba, which extends from the base of Mount Hermon to the Gulf of Akabah. The length of El-Ghor from the Sea of Galilee to the Dead Sea is about 65 miles, and its width varies from 6 to 12 miles.

ELGIN, ĕl′gĭn. A royal burgh, capital of Elginshire, or Morayshire, Scotland, on the Lossie, about 5 miles from its seaport Lossiemouth, on the Moray Firth, and 71 miles northwest of Aberdeen (Map: Scotland, E 2). Its once magnificent cathedral, partly of Early English and partly of Middle Pointed architecture, dedicated to the Holy Trinity, begun by Bishop Andrew Moray in 1224, is now a ruin. The castle, styled of old the manor of Elgin, whose ruins, surmounted by an obelisk—erected to the memory of George, fifth and last Duke of Gordon—crown the Lady Hill, was a residence of the earls of Moray, for some time superiors of the burgh. Among the modern buildings are Gray's Hospital, Anderson's Institution, county buildings, court-house, and asylum. Population of Parliamentary burgh, in 1901, 8407. About two miles north of the town on the edge of Loch Spynie are the remains of the strongly fortified palace of the bishops of Moray; and six miles to the southwest in a beautiful valley are the picturesque ruins of the Cistercian Pluscarden Priory, founded about 1230. Elgin was probably a royal burgh as early as the reign of King David I. (1124-53), and had its privileges confirmed by several of his successors.

ELGIN, ĕl′jĭn. A city in Kane County, Ill., 37 miles west by north of Chicago, on the Chicago, Milwaukee and Saint Paul, and the Chicago and Northwestern railroads, and on the Fox River (Map: Illinois, D 1). The city is in a fine agricultural region, and is the centre of extensive dairy and ice industries. It possesses good water-power, and has numerous manufacturing plants, which include famous watch-factories, condensed-milk works; a silver-plate factory, shirt-factory, watchcase-factory, shoe-factories, machine-shops, foundries, flouring-mills, etc. In the city are the Elgin Academy, a Roman Catholic seminary, and the Northern Illinois Hospital for the Insane, accommodating 1800 patients. There are also two hospitals, Gail Borden Public Library, and a system of parks. Elgin was settled in 1835, and was chartered as a city in 1854. Its government is conducted under a charter of 1880, which provides for a mayor, chosen every two years, and a city council, half of whose members are elected in alternate years. Excepting the mayor, clerk, city attorney, treasurer, and the school board, who are elected by the people, all municipal officials are appointed by the executive, with the council's consent. Town meetings are held annually. The city owns and operates its water-works plant, and owns and leases its electric-light plant. Population, in 1890, 17,823; in 1900, 22,433; in 1906 (local census), 26,425.

ELGIN, ĕl′gĭn, THOMAS BRUCE, seventh Earl of (1766-1841). An English diplomat. He was educated at Harrow, Saint Andrews University, and in Paris; succeeded to the Earldom of Elgin and Kincardine in 1771; entered the army in 1785, and gradually rose to the rank of major-general. In 1790 he began his diplomatic career as a special envoy to the Emperor Leopold II. In 1792 he was made Minister at Brussels, and in 1795 Envoy Extraordinary at Berlin. From 1799 to 1805 he was English Ambassador to the Ottoman Porte, and it was while occupying this position that he began gathering the collection known as the 'Elgin Marbles' (q.v.), purchased by the Government for the British Museum in 1816. Elgin was a representative peer from Scotland from 1790 to 1840, but took little part in public affairs after his return from Turkey.

ELGIN, eighth Earl of, and **KINCARDINE**, twelfth Earl of, JAMES BRUCE (1811-63). A British diplomat and statesman, the son of the preceding. He was born in London, and was educated at Eton and Oxford. In 1841 Southampton elected him a Liberal-Conservative member of Parliament, but as his father died the same year, he succeeded to the Scotch peerage, which excluded him from the House of Commons without admitting him to the House of Lords. He began his official career at the age of thirty, as Governor of Jamaica, and was Governor-General of Canada from 1847 to 1854. His settlement of the free-trade and fishery questions with the United States led to his admission to the English peerage in 1849, as first Baron Elgin. In 1857 he proceeded to China with an army, as special envoy to demand reparation for the illegal seizure of a British vessel. At Point de Galle he heard of the Indian Mutiny, and without hesitation diverted his army to the assistance of Lord Canning, who with his help was enabled to hold out until reinforcements arrived. The mission to China was delayed, but eventually Lord Elgin arrived there, and the Tientsin Treaty was consummated in 1858. On his return to England he was appointed Postmaster-General, and elected lord rector of Glasgow University; but as the Chinese refused to ratify their treaty, he went back to China, and with a combined force of English and French captured Peking (in 1860), and this time concluded a satisfactory convention, which regulated the Chinese relations with the West down to 1890. In 1862 Lord Elgin became Viceroy of India, but in 1863 he died. Consult: Walrond (ed.), *Letters and Journals of James, Eighth Earl of Elgin* (London, 1872); Loch, *Personal Narrative of Occurrences During Lord Elgin's Second Embassy to China, 1860* (London, 1869); Oliphant, *Narrative of the Earl of Elgin's Mission to China and Japan in the Years 1857-58-59* (New York, 1860); Stephen, *Dictionary of National Biography*, vii., by Arbuthnot; Kaye, *Life of Lord Metcalfe* (London, 1858); Bourinot, *Lord Elgin* (Toronto, 1903). See also INDIA.

ELGIN AND KINCARDINE, VICTOR ALEXANDER BRUCE, ninth Earl of (1849—). An English statesman, born at Monklands, near Montreal. He succeeded his father in 1863, studied at Eton and Oxford, and became, in 1886, Treasurer of the Household and First Commissioner of Public Works. From 1894 to 1899 he was Governor-General of India, in 1904 headed the Commission on the Scottish Church Crisis, and in the following year became Colonial Secretary in the Campbell-Bannerman ministry.

ELGIN MARBLES. A celebrated collection of ancient sculptures, brought from Greece by Thomas, seventh Earl of Elgin, and acquired from him for the British Museum. On his appointment as Ambassador to the Porte in 1799, Lord Elgin prepared to have drawings and casts made of the Athenian sculptures, but he was hindered until, in 1801, he secured a new firman, giving him enlarged powers, and particularly forbidding any hindrance to his "taking away any pieces of stone with inscriptions or figures." After a year of toil, the principal figures from the pediments, 15 metopes and 56 slabs from the frieze of the Parthenon, one of the so-called Caryatids from the Erechtheum, part of the frieze of the Temple of Athena Nike, and numerous fragments and inscriptions, had been prepared for shipping. The war with France delayed the shipment, and though the first boxes reached England after a short time, it was 1812 before the last consignment arrived. Strange as it now seems, the Elgin Marbles were at first received coldly and even with severely hostile criticism. The Society of Dilettanti, Payne Knight at the head, decried them as merely architectural pieces, the work of draughtsmen scarcely worthy of the name of artists, and it was not till such recognized authorities as Visconti and Canova had pointed out their historical and artistic value, that in 1816 a committee of the House of Commons was appointed to consider their purchase by the Government. Lord Elgin had already spent £51,000, besides the loss of interest, which he estimated at £23,240. The hearing proved the legality of his title, and the testimony of many artists confirmed the favorable judgments of the foreign critics, so that the committee reported to the House on June 7, 1816, in favor of their purchase for £35,000. The attacks against Lord Elgin were by no means confined to the criticism of his marbles. His act was denounced violently as vandalism of the most flagrant kind, and the wrath of Lord Byron found expression in 'Childe Harold's' lament over "The walls defaced, the moldering shrines removed by British hands." There can be no doubt that in the removal of some of the metopes Elgin's workmen had wrought considerable damage to what still remained of the Parthenon, after the explosion of 1687; but a large part of the sculptures were not in place, and those that had not fallen were a mark for the wanton destructiveness of the Turkish garrison. The accounts of contemporary travelers, and the present condition of what was left behind, show very plainly what would have been the fate of these masterpieces had they not been rescued. The Turks had already used many fragments in the walls of the Acropolis and of private houses, and a considerable mass of marble had only recently been burned to furnish lime for mortar. Consult: Michaelis, *Der Parthenon* (Leipzig, 1871); id., *Ancient Marbles in Great Britain*, trans. by Fennell (Cambridge, 1882); *Ancient Marbles in the British Museum*, vols. vi.-ix. (London, 1830-39; 1842); A. H. Smith, *Catalogue of Sculpture in the Department of Greek and Roman Antiquities* (London, 1892). For the subjects of these sculptures, see PARTHENON; for their place in the history of Greek art, see GREEK ART.

ELGINSHIRE, ĕl′gĭn-shĭr, MORAYSHIRE, or MURRAYSHIRE. A maritime county in the northeastern part of Scotland, on the Moray Firth (Map: Scotland, E 2). Area, 476 square miles. In the south the high and rugged Monadhliadh Mountains of Inverness-shire divide the basins of the Spey and Findhorn. The soil is very fertile in the north and the county is noted for its advanced state of agriculture. It has profitable salmon fisheries. Its principal industry is the manufacture of whisky. Chief town, Elgin. Population, in 1801, 27,760; in 1851, 39,000; in 1901, 44,800.

EL-HASA, *e*l-hä′zȧ. A tributary State of Turkey, included in the Turkish Vilayet of Basra, on the eastern coast of Arabia (Map: Turkey in Asia, R 10). Its surface is generally flat and sandy, with here and there an oasis. The inhabitants, who number about 150,000, are chiefly engaged in raising camels and in cultivating dates. Capital, El-Hofuf (q.v.). The territory has been a dependency of the Ottoman Empire since 1819.

EL-HOFUF, *e*l-hȯ-fo͞of′, or **HOFHUF**. The capital of El-Hasa, Arabia, near the Persian Gulf (Map: Turkey in Asia, R 10). It has an estimated population of over 42,000.

E′LI (Heb. *'Eli*, elevation). A priest, and, according to the biblical account, also one of the judges of the Hebrew confederacy. He was of the family of Ithamar, the youngest son of Aaron (cf. I. Chron. xxiv. 3 with II. Sam. viii. 17 and I. Kings ii. 27), and apparently the first high priest in that branch of Aaron's family, the office having previously belonged to the family of Aaron's son Eleazar (cf. Judges xx. 28). Eli was also judge over Israel for forty years (I. Sam. iv. 18, the Septuagint has 'twenty years'). The boy Samuel was brought up in the temple under his care (I. Sam. ii. 11, 21). Eli's two sons, Hophni and Phinehas, were guilty of serious misconduct (I. Sam. ii. 12-17, 22), for which Eli reproved but did not punish them (I. Sam. ii. 23-25). For this neglect Yahweh censured him, telling him, first through 'a man of God' (I. Sam. ii. 27-36) and then through the youthful Samuel (I. Sam. iii. 11-18), that his house should be punished for its wickedness. This promise was executed in the battle of Ebenezer (I. Sam. iv. 1, 10-11), when Hophni and Phinehas were slain and the ark of God taken by the Philistines. When Eli, then ninety-eight years old, heard the news, he fell backward from his seat and died (I. Sam. iv. 15, 18). The priesthood finally passed out of the house of Ithamar in the days of Solomon (I. Kings ii. 27).

E′LIA. See LAMB, CHARLES.

ELIA, RABBI. See WILNA, RABBI ELIA.

ELI′AS, APOCALYPSE OF. See APOCRYPHA, section *Old Testament*.

ELIAS, ȧ-lē′ȧs, DOMINGO (1805-67). A Peruvian statesman. He was born at Ica, Peru, and was educated at the College of Madrid and in France. Returning to Peru in 1825, he became an enthusiastic supporter of liberal and progressive principles. One of his most noteworthy achievements was the introduction of the planting of cotton on a large scale into the new republic. The cultivation of the vine and the introduction of Chinese labor were also due to him. He established at Lima the College of Our Lady of Guadalupe, and several other educational institutions, and afterwards played a conspicuous part as a soldier and legislator. He became President of Peru in 1858.

ELIAS, NEY (1844-97). An English explorer and diplomat, born at Widmore (Kent). In 1865 he became a fellow of the Royal Geographical Society, in 1866 went to Shanghai, China, as the employee of a mercantile firm, and in 1868 set out upon an expedition for the examination of the new and old courses of the Hoang-ho. In 1872 he undertook a difficult journey of 4800 miles across the Gobi Desert to Nizhni-Novgorod. The results of this expedition were described by him in a paper written for the Royal Geographical Society from which he received a gold medal.

He was appointed extra attaché to the Foreign Office at Calcutta in 1874, shortly afterwards assistant to the British resident at Mandalay, and in 1877 an attaché to the mission at Kashgar. Later he was variously detailed for special duty, and from 1891 until his retirement in 1896 was Consul-General for Khorasan and Seistan. In 1885 he began a survey from the Chinese boundary to Ishkashim (a distance of 600 miles). During this expedition he contributed much to the determination of the geography of the Pamirs, and decided the Panja River to be the upper course of the Oxus, or Amu-Daria. His writings include chiefly papers in the journals of the Royal Asiatic Society and the Royal Geographical Society, and an English version of the *Tarikh-i-Rashidi* of Mirza Haidar (with E. D. Ross, 1897).

ELIAS LEVI'TA. See Levita, Elias.

ÉLIE DE BEAUMONT, ā'lā' de bō'mōɴ'. Jean Baptiste Armand Louis Léonce (1798-1874). A French geologist. He was born at Canon (Calvados), and educated at the Ecole Polytechnique and the Ecole des Mines in Paris. In 1823 he accompanied Dufrénoy and De Villiers on a scientific tour of England and Scotland. Many of the scientific observations made during this journey were embodied in the volume, *Voyage métallurgique en Angleterre* (1827), of which Elie de Beaumont and Dufrénoy were joint authors. Elie de Beaumont was one of the founders of the geological survey of France, and rendered valuable services in the publication of maps and descriptions of the geology of that country. He also made an exhaustive study of mountains, and it is in this connection, perhaps, that his name is best known to scientists. While his theory, that mountain ranges of the same orientation are contemporaneous and formed by the same causes, did not meet with general acceptance, it was the means of attracting increased interest to this branch of geology. In its support he also collected and published much new information. In 1829 he was made professor of geology at the Ecole des Mines, and in 1835 he became a member of the Academy of Sciences. On the death of Arago (1853) he was selected to serve as perpetual secretary of the Academy. He was elected to membership in many foreign scientific societies, including the Academy of Berlin and the Royal Society of London. In 1852 he became, by decree, a Senator of France. His best-known works are *Leçons de géologie pratique* (1847) and *Notice sur le système des montagnes* (1852).

ELIGIUS, ē-lĭj'ĭ-ŭs, Saint, also called Eloi, or Eloysius (c.588-659). An artist and bishop of early France, the patron saint of goldsmiths. He was born near Limoges, about 588. He learned the goldsmith's trade, was introduced at the Court of Clotaire II., and became Master of the Mint under that king and his son and successor, Dagobert I. (628-38). Both kings trusted him with important works, among them a chair of gold, which is said to be still extant. He also made shrines, ornaments for tombs, sarcophagi, etc. Eligius was a faithful and conscientious servant of his masters, and showed a strong inclination to piety. He gave liberally to the poor, founded religious houses, and was active against heretics. In time he became a priest, and in 641 was made Bishop of Noyon. After setting the affairs of his diocese in order, he made a missionary visit to the heathen of Flanders and Zeeland. His life and works are in Migne, *Patrologia Latina*, lxxxvii.

ELIHU, ē-lī'hū *or* ĕl'ĭ-hū. One of the speakers in the Book of Job. In the prose introduction to his four speeches, which occupy chaps. xxxii.-xxxvii., he is said to be a son of Barachel, the Buzite, of the family of Ram. The fact that his name does not occur among the friends of Job in the old prose story preserved as a prologue and an epilogue to the work indicates that the section ascribed to Elihu is a later supplement to the dialogues. This conclusion is amply sustained by the internal evidence. Though the author appears with an air of superior knowledge, as if a new solution of the riddle were to come from his lips, his arguments are precisely the same that have already been urged by the three friends. Even his language is reminiscent of their speeches. The most incisive and sympathetic criticism cannot make of the chapters a real contribution to the discussion or a work worthy of the pen of that inspired poet to whom we owe the dialogues. Only in his angelology does the author show a certain originality; but his views on that subject have no bearing on the great arguments of the book, and clearly betray his later date. The weight of scholarly opinion is strongly against the authenticity of these speeches. Such critics as have recently attempted their rehabilitation have been largely influenced by the manifest possibility of greatly improving the text by conjectural emendation. Consult: Duhm, *Das Buch Hiob* (Freiburg, 1897); Budde, *Das Buch Hiob* (Göttingen, 1896); Cheyne, "Job," in *Encyclopædia Biblica*, (London, 1899).

ELI'JAH (Heb. *Eliyāhū*, Yahweh is God; in the Greek form, occurring in the New Testament, *'Ηλίας, Elias*). A Hebrew prophet of an early type, who, however, helps to inaugurate the movement that leads to the triumph of ethical monotheism among the Hebrews. The story of Elijah is elaborately told, chiefly in connection with the reign of Ahab (I. Kings xvii.-xxi.), but also in connection with that of Ahab's successor, Ahaziah (II. Kings i.-ii.). This narrative is probably based, as is also the story of Elisha (Elijah's successor), on separate literary sources which lay before the compiler of Kings, and which contained a series of stories with legendary embellishments of the earlier prophets and seers that have been rather skillfully woven into the narrative of the kings of Israel and Judah. Elijah, whose home appears to have been in Gilead (though the reading I. Kings xvii. 1 is not certain), may be designated as a Yahweh purist, who resented the amalgamation of the Yahweh cult with the worship of the Canaanitish Baalim (see Baal), and whose fierce opposition was brought to a climax by Ahab's readiness, for political reasons, to introduce the cult of the Tyrian Baal into the domain of Israel. He represents the opposition to all Baal-worship brought to a focus through the step taken by Ahab in adding to the local Baal cults the worship of a Baal originally akin to the Canaanitish Baals, but who as the specific Baal of Tyre outside of Hebrew domain was introduced merely as a symbol of the alliance between Israel and the Tyrian kingdom that was brought about by the marriage of Ahab with the Tyrian princess Jezebel.

Elijah is rather abruptly introduced by the writer as the uncompromising opponent of Ahab, to whom he declares that no rain or dew is to fall save at the Prophet's declaration. A famine ensues, during which time Elijah is miraculously fed by ravens. The famine increases, and at last Ahab is forced to yield and give his consent to a contest between Elijah and the prophets of Baal. The latter call upon Baal to send down the rain, but in vain. When Elijah, however, appeals to Yahweh, lightning comes to consume the bullock which the Prophet had placed on an altar soaked with water. By the order of Elijah, the prophets of Baal are slain at the brook Kishon, and rain is sent by Yahweh. Such is the general character of the Elijah stories, all intended to illustrate the superiority of Yahweh over other gods. Ahab is represented as again led astray by Jezebel, who continues the opposition to Elijah. At times the latter is portrayed nigh unto despair; but he is encouraged by Yahweh, who appears to him in the 'rustling of the breezes,' and while threatening destruction to Israel promises escape to those who do not bow the knee to Baal. Even though the story of his life as given in the Bible be considered as having legendary and mythical features, we see in Elijah one of the most striking figures in Hebrew history—one whose attitude foreshadows important changes in the religious life of the people. He shares, however, many of the characteristics of the old-time seer, whose chief function it was to give oracles and to control the moods of the deity in whose service he stood. He wears a primitive dress—a robe of goat's or camel's hair with a leathern girdle. He is accompanied often by a guild of prophets, though at times he mysteriously disappears and seeks the solitude of the wilderness. So, during the great famine, it is in the wilderness that ravens bring him bread and meat every morning and evening, and it is again in a solitary spot of the wilderness beyond Beersheba that his strength is miraculously restored to him through a cake and a cruse of water that suddenly appear and which sustain him for forty days. He is not connected with any sanctuary, and holds no position at the Court. His appearance is as sudden as his disappearance. His courage is unbounded, for those parts of the narrative which picture him denouncing King Ahab—as e.g. for the judicial murder of Naboth, I. Kings xxi. 17-20 (see AHAB)—rest upon historical ground that may be regarded as solid, even though details have been added to color the dramatic situation. The transfiguration of Elijah, which takes place in the presence of his disciple Elisha (II. Kings ii. 11), may be a strange touch illustrating the admixture of myth and legend. A fiery chariot with fiery steeds descends from above, and Elijah rides in the storm to heaven. An old storm myth, in which the rolling of the clouds is taken as portraying the storm-god himself riding in his chariot, may have been incorporated into the story of the old prophet. The mantle of Elijah falls from him as he ascends and it is picked up by Elisha. In this way the indication is given that Elisha is to continue the work of Elijah. See ELISHA.

ELIJAH. An oratorio, first performed at Birmingham, England, August 26, 1846, the music of which is by Mendelssohn and the words by Bartholomew. The biblical passages reproduced were selected by Shubring.

ELIM'INANT. See DETERMINANTS; ELIMINATION.

ELIM'INA'TION (from Lat. *eliminare*, to turn out of doors, from *ex*, out + *limen*, threshold). A process by which, from a number of statements concerning several quantities, a separate statement concerning each is obtained. In a larger sense, it means the setting aside of all extraneous considerations—of everything not essential to the result. In algebra, elimination is the operation which causes a quantity or a letter common to two or more equations to disappear, thus reducing a given system of equations to one of a less number of unknowns. If three unknown quantities, for instance, are to be found from three independent equations, the first step is to form from the three given equations two new ones, so as to eliminate one of the unknown quantities. From these two equations another of the unknown quantities is eliminated, giving one equation of one unknown quantity, the value of which is then found. In solving simultaneous linear equations, the simplest methods are those of addition (or subtraction) and comparison. In the former method the coefficients of the unknown to be eliminated are made alike, or alike except in sign, and the two equations subtracted or added member to member, thus causing the unknown to disappear. In the latter case each equation is solved for the chosen unknown in terms of the other unknowns, and these expressions for the same quantity equated one to another. In complicated equations, elimination becomes difficult and often impossible. Two methods for eliminating a single unknown from two consistent equations of any degree deserve special mention. The first, known as Sylvester's dialytic method, will best be understood from an example:

To eliminate x from the equation—

$$\begin{aligned} a_3x^3 + a_2x^2 + a_1x + a_0 &= 0 \\ b_2x^2 + b_1x + b_0 &= 0 \end{aligned}$$

Multiplying the members of the first equation by x, and those of the second by x and x^2 successively, we have—

$$\begin{aligned} a_3x^3 + a_2x^2 + a_1x + a_0 &= 0 \\ a_3x^4 + a_2x^3 + a_1x^2 + a_0x &= 0 \\ b_2x^2 + b_1x + b_0 &= 0 \\ b_2x^3 + b_1x^2 + b_0x &= 0 \\ b_2x^4 + b_1x^3 + b_0x^2 &= 0 \end{aligned}$$

The eliminant of these five equations in x^4, x^3, x^2, x is—

$$\begin{vmatrix} 0 & a_3 & a_2 & a_1 & a_0 \\ a_3 & a_2 & a_1 & a_0 & 0 \\ 0 & 0 & b_2 & b_1 & b_0 \\ 0 & b_2 & b_1 & b_0 & 0 \\ b_2 & b_1 & b_0 & 0 & 0 \end{vmatrix} = 0$$

(See DETERMINANTS.)

This method may be applied to certain systems of more than two equations. Euler also suggested an ingenious method, as follows:

Given the equations:

$$\begin{aligned} F(x) &= a_3x^3 + a_2x^2 + a_1x + a_0 = 0 \\ f(x) &= \qquad\qquad b_2x^2 + b_1x + b_0 = 0 \end{aligned}$$

These equations, being consistent, have a common root, r. Hence—

$$\frac{F(x)}{x - r} = a_2x^2 + a_1x + a_0$$

$$\frac{f(x)}{x - r} = \beta_1x + \beta_0$$

Dividing these equations number for number and equating the coefficients of like powers of x, five equations are found, whose eliminant is the same as that given above. Consult: Muir, *Theory of Determinants* (London, 1890); Burnside and Panton, *Theory of Equations* (Dublin, 1901).

ELÍO, ā-lē′ō, Francisco Javier (1767-1822). A Spanish general. He was born at Pamplona, and was educated at the Military Academy of Puerto Santa Maria. He fought with distinction in the wars in Northern Africa, and in the campaign with France (1793-1795), and on September 9, 1807, recaptured Montevideo from the English, and became governor of the city. Recalled to Spain in 1812, he became commander of the Army of Murcia, and was afterwards appointed Governor and Captain-General of that province and of Valencia. In consequence of his cruelty and tyranny, he was captured after the reëstablishment of the Constitution of 1812 and imprisoned by the insurgents in the citadel, where, upon an attempt of the soldiery to effect his release, he was brought before a popular tribunal, sentenced to death, and executed.

EL′IOT, Charles William (1834—). An American educator of note. He was born in Boston, Mass., graduated at Harvard in 1853, was tutor in mathematics there from 1854 to 1858, and was assistant professor of mathematics and chemistry in the Lawrence Scientific School of Harvard from 1858 to 1863. The years 1863-65 he passed in Europe in the study of chemistry and in the investigation of educational methods, and from 1865 to 1869 he held the chair of analytical chemistry in the Massachusetts Institute of Technology, then newly founded. In 1869 he became the twenty-second president of Harvard. His accession marked an epoch in the history of the institution. He forthwith began a remodeling of the curriculum on a liberal basis, broadly patterned after that of European universities. The elective system as known to American education was devised by him. His aim was to make this system, as conducted at Harvard, not less strict in its requirements, but more inclusive in its privileges, than that traditionally associated with the American college. He became an acknowledged authority on higher education, and his annual reports have been regarded as important in the study of problems connected with the subject. He also became widely known as an occasional speaker and a writer on educational and other topics. He was elected to numerous learned organizations, including the American Academy of Arts and Sciences of Boston, the American Philosophical Society, and the Massachusetts Historical Society. His publications include *The Compendious Manual of Qualitative Chemical Analysis* (with F. H. Storer, 1869; 16th ed., as revised by Nichols and re-revised by Lindsay, 1892); *The Working of the American Democracy*, an address (1888); *American Contributions to Civilization, and Other Essays* (1897); *Educational Reform: Essays and Addresses* (1898); *More Money for the Public Schools* (1903).

ELIOT, George (1819-80). The pseudonym of Mary Ann Evans, generally recognized as the foremost of English women novelists. The Evans family, originally Welsh, was of sturdy, middle-class stock. Her grandfather, George Evans, was a carpenter and builder in Derbyshire. Her father, Robert, bred to the same business, seems to have been a man of uncommon vigor, both physical and mental, with an inborn knowledge of valuations that won him high repute as a land agent. In this capacity he was engaged by Mr. Francis Newdigate to take charge of his Arbury estate in Warwickshire, and here, at South Farm, George Eliot, the third child by his second wife, was born, in the heart of that stolid farming life of the English midlands which she was later to mirror back so faithfully. The details of the author's early years, her companionships, her physical surroundings and mental growth, might easily be filled in from her writings, since few novelists have drawn so freely from their own personal and intimate experiences. The chief landmarks of the neighborhood can readily be identified in her earlier volumes. Arbury Court is the 'Cheverel Manor' of *Mr. Gilfil's Love Story;* the town of Nuneaton is the 'Milby' of *Janet's Repentance;* and its suburb, Chilvers Coton, figures as 'Shepperton' in *Amos Barton.* Her family are admittedly the prototypes of the Dodsons in *The Mill on the Floss;* there is much of her brother Isaac in the Tom Tulliver of the same novel; and critics have traced a resemblance between her father and Caleb Garth in *Middlemarch*, and have identified her mother with the inimitable Mrs. Poyser in *Adam Bede.* These analogies must not be pushed too far, but that George Eliot's own personality is set forth in the character of Maggie Tulliver there can be no doubt. As a piece of unsparing self-revelation, a searching analysis of a child's moods and emotions, it can hardly be duplicated. In Maggie, she has drawn herself as an impetuous, proud, and highly sensitive child, with an instinct for passionate devotion to some one person—an instinct which throughout her life was a vital necessity to her. Like Maggie, too, she was not a precocious child, preferring play to study, and learning to read with difficulty. It must be admitted that at this time her stock of books was not inspiring, chief among them being *Æsop's Fables, Joe Miller's Jest-Book*, and Defoe's *History of the Devil.* The local schools of Nuneaton supplied her early needs, but the important formative years from twelve to fifteen were passed at a school in Coventry, the tone of which was strongly evangelical. Her mother's death in 1835, devolving upon her much of the care of the farm, interrupted her studies temporarily. Yet she soon found means to gratify her awakened thirst for knowledge, though so assiduously and unsystematically that at the age of nineteen she could describe her mind as "an assemblage of disjointed specimens of history, ancient and modern, scraps of poetry picked up from Shakespeare, Cowper, Wordsworth, and Milton, morsels of Addison and Bacon, Latin verbs, geometry, entomology, and chemistry."

When George Eliot was twenty-one, her father's retirement from business and his removal to Coventry brought a momentous change into her life. Hitherto she had stifled in the intellectual isolation of dull, monotonous farm life. Henceforth her mental horizon was destined to grow steadily broader. At Coventry she met George Bray, the author of an *Enquiry Concerning the Origin of Christianity*, which profoundly affected her religious views. In the first enthusiasm of her new convictions she ceased to attend church—an attitude of open aggressiveness which almost led to a serious breach with her father. But friends effected a reconciliation, she agreed to attend services once more, and for the remainder of her life maintained a consistent tolerance toward the sincere beliefs of others, even when she regarded them as mere superstitions. It was through George Bray that she was led to undertake her first serious literary work, a translation from the German of Strauss's *Life of Christ*. The task absorbed her for two years, though it seems to have bored her sadly toward the end, and at times she revolted from her author's attitude. In 1846, when her translation appeared, she declared herself 'Strauss-sick'—it made her ill dissecting the beautiful story of the crucifixion.

George Eliot's life as an author, from the appearance of the Strauss translation to the day of her death, may conveniently be divided into three periods, the first extending down to her union with Mr. Lewes in 1853; the second and third covering respectively her earlier and later novels, sharply divided by the production of *Romola*. Her father's death in 1849 leaving her free, she made her first visit to the Continent, spending eight months in Geneva. A review of Mackay's *Progress of the Intellect*, which appeared in the *Westminster Review* soon after her return, resulted in her appointment as assistant editor of that review, as reorganized by Mr. Chapman. Through the *Review* she came in contact with many of the chief literary lights of the period, with Froude and J. S. Mill, Theodore Parker and Harriet Martineau. But "her brightest spot is the deliciously calm new friendship that Herbert Spencer gives her," and it was through the latter that she met George Henry Lewes.

To what extent an open disregard for accepted conventions may be excused by an honest belief in the integrity of one's own purpose can probably never be decided. It is certain that George Eliot felt deeply the censure of relatives and friends, yet at the same time she was firm in her conviction that her acts were justified. A legal marriage was impossible, since Lewes already had a wife living, from whom he was separated under circumstances that precluded the possibility of a divorce. But that both Miss Evans and Lewes regarded their union as possessed of all the solemn force of a lifelong tie there can be no doubt. Equally certain is it that whatever fame George Eliot achieved as a novelist, she owed it in the first instance to the encouragement and unswerving faith of Lewes. Whether his influence in the working out of specific details of plot was always for the best may be questioned; but it is more than likely that without the stimulus of his belief in her powers her first novel would never have been written.

The Sad Fortunes of the Rev. Amos Barton, her first essay at fiction, appeared in *Blackwood's Magazine* in 1857, and was followed by *Mr. Gilfil's Love Story* and *Janet's Repentance*, afterwards united in a single volume, *Scenes of Clerical Life*. The volume evoked warm praise from many sources, notably from Thackeray, who thought the author was a man.

The personal side of George Eliot's life during the years following her discovery of her real talents may be summed up briefly. They were years of strenuous work, handicapped by a frail physique, and brightened by pleasant summers in Germany, a few weeks in Florence, gathering material for *Romola*, and a trip to Spain, in search of local color for the *Spanish Gypsy*. In November, 1878, the death of Mr. Lewes came as a crushing blow, but she found congenial occupation in planning and founding a studentship in his memory. Mr. John Walter Cross, who had long been on intimate terms with the Leweses, now became a constant visitor, and in the spring of 1880 George Eliot consented to marry him, the marriage taking place on May 6th. At this period she could write, "Deep down there is a river of sadness, but this must always be with those who have lived long—and I am able to enjoy my newly reopened life." She was not destined to enjoy it long. A serious illness in the autumn, followed by a relapse early in December, exhausted her vitality, and before the close of the month she was dead.

Which of her novels represents the culmination of George Eliot's powers is likely to remain a subject of controversy. Some critics will share with Mr. Oscar Browning the belief that her genius was of steady and uniform growth, reaching its greatest height in her last work, *Daniel Deronda*. Others, like Sir Leslie Stephen, will continue to believe that nothing she produced subsequent to *Silas Marner* equals the volumes that preceded it. There will always be a select few who will look upon that remarkable *tour de force*, *Romola*, as the turning-point in her career; while the volume which has steadily enjoyed the widest popularity with the general reader is *Adam Bede*. This last-mentioned story was suggested by an anecdote related to the author by an aunt, a Methodist preacher, who once passed a night in prayer with a girl condemned for child-murder. The aunt became the Dinah Morris of the story, and, at the suggestion of Lewes, was made the centre of interest from first to last—a change which more than one critic has censured. The lasting merit of this book, as of *The Mill on the Floss*, which followed it, is less in the plot than in the marvelous alchemy which transforms the narrow, humdrum lives of dull-witted farming folk into vital pictures full of sympathetic appeal. *The Mill on the Floss* is sometimes pronounced an ill-proportioned piece of work, and the author herself admitted that her memories of childhood days lured her into unduly amplifying the earlier part. Yet it is the commonplace and wholly natural chatter of the Dodsons and Gleggs and Tullivers, the childish joys and sorrows of Maggie, her quarrels with Tom, her father's sympathy with his 'little wench,' that are remembered long after the later chapters of error and renunciation have grown dim. *Romola* was George Eliot's most ambitious work. It was an attempt to work out some deeply interesting ethical problems, not in the familiar atmosphere of her English midlands, but in the Florence of Savonarola and the Renaissance. The task demanded an amount of special research that was exhausting. She herself said of it that she began it as a young woman and finished it as an old one. It has sometimes been called the greatest historical novel ever written; and if profound erudition, a noble theme, and a fertile play of imagination are the first tests of an historical novel, this praise is justified. Yet it was not a commercial success in the *Cornhill Magazine*, which had paid £7000 for the serial rights; and critics most familiar with Italian life, such as Browning, Rossetti, and William Story, frankly said that they could not read it, because, in spite of the erudition, the book as a whole did not ring true. *Middlemarch*, which represents a return to the author's earlier field, has had its share of champions. It has sometimes been defined as a great prose epic of English provincial life, a huge picture of the manners and customs of social strata a degree or two higher up than the Dodsons and the Poysers. Like real life, it is composite, an intricate fabric of many interwoven stories. Yet the principal actors—Dorothea and Casaubon, Rosamund and Lydgate—stand out distinct, familiar portraits in the permanent gallery of characters in English fiction. The fiercest controversy of all has been waged over *Daniel Deronda*. It has been stigmatized as a tendency novel, the strongest proof of Lewes's pernicious influence. The characters have been pronounced severally and collectively unreal. Mordecai has been declared a bore, and his dream of restoring the Jewish nationality chimerical. Deronda himself is "an amiable monomaniac and prosy moralist." Yet other critics have seen in it "a work as far superior to *Adam Bede* as *Hamlet* is superior to *Much Ado About Nothing*," an effort to scale the loftiest heights and sound the lowest depths of human nature, and, conceding the impossibility of the task, have recognized the nobility of the partial failure.

George Eliot's claims to recognition as a poet rest almost wholly upon one long dramatic poem, *The Spanish Gypsy*. The motive is a young girl's renunciation of happiness when, on the eve of marriage, she learns that her father is a gypsy, who is about to found a gypsy nation in Africa, and requires her to sacrifice lover, country, and religion, in order to join him. The verse, however, is at best not of a high order, and the plot lacks common sense. The first collected edition of her works was made in Edinburgh and London, 1878-80. Consult: *George Eliot's Life as Related in Her Letters and Journals*, arranged and edited by her husband J. W. Cross (3 vols., London, 1885); Parkinson, *Scenes from the George Eliot Country* (Leeds, 1888); James, *Partial Portraits* (London, 1888); Blinde, *George Eliot* (London, 1883); Dowden, *Studies in Literature* (London, 1878); Browning, *Life of George Eliot* (London, 1892); Stephen, *George Eliot* (New York, 1902).

ELIOT, or **ELLIOT**, GEORGE AUGUSTUS. See HEATHFIELD, GEORGE AUGUSTUS.

ELIOT, Sir JOHN (1592-1632). An English patriot and statesman, born at Port Eliot, Cornwall, April 20, 1592. He spent three years at Exeter College, Oxford, where, however, he did not take a degree, and after studying law traveled on the Continent, where he became friendly with George Villiers, afterwards Duke of Buckingham. At the age of twenty-two he entered Parliament, and at twenty-seven was made Vice-Admiral of Devon, in which office he captured Nutt, a famous pirate, whose depredations were a constant infliction upon the commerce of the southern coast. By bribery Nutt obtained his release and continued his depredations, while Eliot was imprisoned, on false charges, for four months in the Marshalsea. He received popular sympathy, and immediately upon his release, in 1624, was returned to Parliament, where, during the first three Parliaments of Charles I., with Pym, Hampden, Selden, and Coke, he was the foremost leader in resisting the encroachments of the Crown. He spoke boldly against the venality of the Ministry and the unwarranted foreign policy of his former friend Buckingham, and urged Parliament to withhold supplies until an account was given of the money already voted. For comparing Buckingham to Sejanus he was imprisoned in the Tower in 1626, but the Commons compelled his release and exonerated him by special vote. He suffered another short imprisonment for petitioning the King against forced loans, and later received sentence of outlawry. These persecutions only increased his popularity, and though strenuously opposed by the Court, he was again returned to Parliament in 1628. He took part in drawing up the Petition of Right, and, on the last day of that Parliament, directed Holles and Valentine to hold the Speaker in the chair by force, while he read a protest against tonnage and poundage and other taxes and acts unauthorized by Parliament. Being summoned before the Council, with Holles, Selden, Valentine, and others, he refused to answer for his acts in Parliament except to Parliament itself and was confined in the Tower, with his fellow-members, for more than two months, until popular indignation compelled the King to bring him to trial. The offenders were heavily fined and sentenced to be imprisoned during the King's pleasure; and not to be released until they had given security for good behavior, submitted to the King, and acknowledged their offenses. The confinement of the others was greatly relaxed until they were all released, but Eliot could make no conscientious submission. The rigor of his imprisonment was increased, and his health suffered. His simple and manly petitions for temporary release were ignored, and he was allowed to sicken and die after two years' imprisonment, on November 27, 1632. His death contributed largely to the downfall and execution of Charles. During the Commonwealth Eliot's sentence of conviction was reversed by act of Parliament. His writings include *The Monarchy of Man* (1879); *An Apology for Socrates* (1881); *Negotium Posterorum* (1881); *De Jure Majestatis* (1882); and the *Letter-Book of Sir John Eliot* (1882). Consult: John Forster, *Life of Sir John Eliot* (2d ed. London, 1871); and Gardiner, *History of England* (London, 1893-95), vols. v.-vii.

ELIOT, JOHN (1604-90). A clergyman and missionary of Roxbury, Mass., known as "the Apostle to the Indians." He was born at Widford, Hertfordshire, England, in 1604. He was educated at Jesus College, Cambridge. Influenced by Thomas Hooker, he became a nonconformist, and went to Boston in 1631. For a year he preached in the church of Mr. Wilson in Boston, and in 1632 became settled as "teacher" of the church in Roxbury. He remained there the rest of his life. He acquired the language of the Pequot Indians from a young native taken prisoner in 1637. He first preached before the Indians without an interpreter at Nonantum, now Newton, about five miles west of Boston, on October 28, 1646. This was the beginning of years of toil for the conversion of the Indians, during which Eliot traveled northward to the Merrimac River and into the southeastern part of Massachusetts, and suffered many hardships of weather, travel, and opposition from the native sachems and priests. It was Eliot's policy to separate his converts from their old life, and gather them into communities of "praying Indians." Such a settlement was made at Natick in 1651, and an Indian church organized there in 1660. He subsequently organized sixteen such settlements. A "Society for the Propagation of the Gospel Among the Indians' was formed in London in 1649, and annually sent Eliot a sum of money to supplement the salary he received from the church at Roxbury. The outbreak of King Philip's War in 1675 interrupted the work and broke up the settlements of Christian Indians, but the latter rendered valuable service to the colonists during the war. Eliot's translation of the Bible into the Indian language was completed in December, 1658; the New Testament was published at Cambridge, Mass., in 1661, the Old Testament in 1663. A revision, in preparing which he had the assistance of the Rev. John Cotton of Plymouth, was printed in 1680-85. His *Indian Grammar Begun* was printed at Cambridge in 1666. Of his *Indian Primer* (1669) the only complete copy known to exist is in the library of the University of Edinburgh. Other primers, catechisms, and translations of religious works for the Indians were prepared by Eliot. He was one of the translators of the famous 'Bay Psalm-Book' (1640), and wrote several works in English. His *Christian Commonwealth, or the Civil Polity of the Rising Kingdom of Jesus Christ*, published in London in 1659, was criticised as containing seditious sentiments. After the Restoration the Governor and Council of Massachusetts required him to retract some of his statements. Eliot was a man of attractive personality, simple in life and manners, and kind in temper. He died at Roxbury, May 21, 1690. Consult: Francis, *John Eliot, the Apostle to the Indians*, in "Library of American Biography," vol. v. (Boston, 1836); Winsor, *Memorial History of Boston*, vol. i. (Boston, 1880-81).

ELIOT, SAMUEL (1821-98). An American educator and historian. He was born in Boston, graduated at Harvard in 1839, and spent some years in study and travel in Europe. In 1856 he became professor of history and political science at Trinity College, Hartford, Conn., and from 1860 to 1864 was president of the same institution. From 1870 to 1873 he was a lecturer on history at Harvard, from 1873 to 1876 was head-master of the Girls' High School in Boston, and from 1876 to 1880 was superintendent of the Boston public schools. As president of the American Social Science Association he was active in the first organized movement for the reform of the civil service in 1869. He is the author of numerous historical works, among which are *The Ancient Romans* (1853) and *The Early Christians* (1853), forming the first two parts of a projected *History of Liberty; A Manual of United States History Between the Years 1792 and 1850* (1856); *Poetry for Children* (1879); *Stories from the Arabian Nights* (1879); and *Selections from American Authors* (1879).

ELIOT, SAMUEL ATKINS (1862—). An American clergyman of the Unitarian Church, born at Cambridge, Mass. He graduated at Harvard in 1884, and held pastorates at Denver, Col. (Unity Church, 1889-93), and Brooklyn, N. Y. (Church of the Saviour, 1893-98). From 1898 to 1900 he was secretary of the American Unitarian Association, and in 1900 became its president.

ELIOT, Sir THOMAS. See ELYOT.

EL'IPAN'DUS. See ADOPTIAN CONTROVERSY.

EL'IPHAZ. One of the friends of Job. He is described in Job ii. 11 as a Temanite. The reputation for wisdom of the Edomites probably accounts for the choice of a native of the Edomitish district of Teman as the leader of the three friends. In the dialogues, his speeches are characterized by a certain courtly dignity, kindliness of judgment, and grace of style not so marked in the other interlocutors. His appeal to the authority of revelation, and his general attitude, is best reflected in the classical description of his vision in the night, Job iv. 12-21.

E'LIS (Lat., from Gk. Ἦλις, Elean *ϝάλις*, *Valis;* connected perhaps with Lat. *vallis*, valley). One of the ancient divisions of the Peloponnesus, bounded north and northeast by Achæa, east by Arcadia, south by Messenia, and west by the Ionian Sea. It was originally divided into three districts—Cœle or Hollow Elis, Pisatis, and Triphylia. Of these the first-named occupied the northern part, and was by far the largest and most valuable, comprising as it did the fertile plains watered by the Peneus and the Ladon, and producing excellent crops of wheat, cotton, and flax; while the pastures by the river banks reared cattle and horses of proverbial excellence. Pisatis, in the central portion, is drained by the Alpheus, and is separated from Cœle Elis by Mount Pholoë, a spur of Erymanthus. The low grounds of this division possess great natural fertility. Its southern border was the Alpheus, at whose juncture with the Cladeos was situated the great sanctuary of Olympian Zeus. (See OLYMPIA.) South of the Alpheus was Triphylia, a continuation of the Arcadian hill-country. Pisatis and Triphylia were subject districts, the ruling Eleans, or Epeians, dwelling on their fertile estates in the north. Though Elis had no natural strongholds and few fortified towns, it yet suffered little from war before the end of the fifth century B.C.—an advantage due in part to the sacred character of the country as the seat of the greatest of the national festivals, and in part to its political situation, for the Elean oligarchy which controlled the cities early united the State to the Spartan League. During the Peloponnesian War, however, the Athenians harried the coasts, and from that time the fertile territory was frequently plundered. The inhabitants seem to have been unwarlike, and were accused by the other Greeks of being addicted to lying, drunkenness, and licentiousness. Their prerogative of holding the Olympic games gave the Eleans a prestige which they continued to enjoy in greater or less degree till the games themselves were suppressed by the Emperor Theodosius in A.D. 394. Elis, now Kaloskopi, the capital of Elis, stood on the Peneus, and after its extension in B.C. 471 became one of the important cities of Greece. Here were the three gymnasia in which all the competitors at the Olympic games were obliged to take their preliminary training. Since 1899 Elis has formed a nomarchy of the Kingdom of Greece, the capital being Pyrgos. Consult: Leake, *Travels in the Morea* (London, 1830); Curtius, *Peloponnesos* (Gotha, 1852).

ELI'SHA (Heb., *Elisha*, God is deliverance). A prophet of Israel, who continued the movement of Elijah against the Baal cult. The story of his career is told in II. Kings ii., ix., xiii. as follows: He was the son of Shaphat, and lived at Abel-meholah, where, until his call, he was a farmer (I. Kings xix. 19). While at Horeb Elijah is told to appoint Elisha his successor; this he does by throwing his mantle over him, whereupon Elisha sacrifices the oxen with which he was plowing, and follows Elijah. During the life of his master nothing is heard of Elisha until immediately before Elijah's death. Elisha follows him from Bethlehem to Jericho and then across the Jordan, which Elijah divides with his mantle, and as Elijah is taken up he receives the mantle of his master (II. Kings ii. 13). Elisha also divides the Jordan and comes to Jericho, where he heals the poisonous waters (II. Kings ii. 19-22). On the road to Bethlehem he is met by children who laugh at him for his bald head. He curses them and forty of their number are devoured by two she bears (II. Kings ii. 23-25). He severely rebukes Jehoram and refuses to speak to him, but prophesies for the sake of Jehoshaphat (II. Kings iii.). A wife of one of the sons of the prophets coming to Elisha for aid, he performs the miracle of the oil (II. Kings iv. 1-7), and restores to life the son of another woman who has befriended him (II. Kings iv. 8-37). Another miracle like that performed at Jericho was the removing of the poison from the food prepared by the sons of the prophets (II. Kings iv. 38-41). Still another miracle is the making twenty loaves of bread serve one hundred men (II. Kings iv. 42-44). He cures Naaman of Syria of his leprosy and refuses to take any return for it and curses his servant Gehazi for having taken a present (II. Kings v.). He strikes the Syrian army with blindness, but sends them away in peace after he has brought them to Samaria (II. Kings vi. 8-23). When he sees Hazael he knows at once the suffering that will be brought on Israel, but still tells Hazael that he will be king (II. Kings viii. 7-15.). To fulfill the prophecy of Elijah, Elisha sends a prophet to anoint Jehu, who promptly kills the family of Ahab and takes the throne (II. Kings ix.). Before the death of Elisha he is visited by Joash and predicts three victories against the Syrians (II. Kings xiii. 14-19). Even after his death Elisha performs miracles; a body thrown upon his bones revives and stands up (II. Kings xiii. 20-21).

The character of the Elisha stories, it will be seen, is very much the same as that of those told of Elijah. Both perform miracles, restoring dead persons to life, striking the living with disease, predicting victories or disasters, and the like. While not so rugged as Elijah, he surpasses the latter in the political influence that he exercises. The narrative clearly indicates a progress toward the recognition of Yahweh to the exclusion of the Baal cults, so that Elisha's path is considerably smoother owing to the antecedent activity of Elijah.

ELIS'SA. See Dido.

ELISSA. One of three quaintly differing sisters in Spenser's *Faerie Queene*, whose temperaments were too opposite to permit of agreement. See Medina.

ELIX'IR (Fr. *élixir*, OF., Sp. *elixir*, from Ar. *al iksir*, the philosopher's stone, from *al*, the + *iksīr*, philosopher's stone, probably from Gk. ξηρός, *xēros*, dry, less plausibly from Ar. *kasara*, to break). A term in pharmacy, applied to various preparations, consisting mostly of solutions of aromatic and bitter vegetable substances in spirits of wine. The term tincture is now more common. *Elixir of vitriol*, or aromatic sulphuric acid, is prepared from 1½ fluid ounces of sulphuric acid, 10 fluid ounces of rectified spirit, ½ ounce cinnamon in powder, 1 ounce ginger in powder. While elixirs are made in great variety, but three are official in the U. S. Pharmacopœia: Elixir Aromaticum, Elixir Adjuvans (both flavorings) and Elixir of Quinine, Iron and Strychnine. See Chemistry.

ELIZABETGRAD, yĕ-lĕ'sȧ-bĕt-grȧd'. See Yelizavetgrad.

ELIZ'ABETH. A city and county-seat of Union County, N. J., 12 miles by rail southwest of New York and 4 miles south by west of Newark; on both sides of the Elizabeth River and on Newark Bay and Staten Island Sound; reached by the Central of New Jersey and Pennsylvania railroads, the latter of which traverses the principal section of the city on an immense viaduct of earth and masonry (Map: New Jersey, D 2). A portion of the city bordering on Staten Island Sound is known as Elizabethport. Elizabeth is the suburban home of many New York business men, is laid out with broad and well-graded streets, and has several small parks and many handsome residences. The port is accessible to small vessels, and receives large quantities of coal and iron brought by rail from the Pennsylvania mines for reshipment. The principal industrial establishments are sewing-machine works, pump-works, foundries, chemical-works, and a ship-yard. The city has many points of historical interest. It was settled in 1664 by a company from Long Island, and was called Elizabethtown. On May 26, 1668, the first General Assembly of New Jersey convened here. It was the capital of the Colony from 1755-57. During the Revolution it suffered greatly. It was chartered as the 'Borough of Elizabeth' in 1789, and was incorporated as a town in 1796. It was chartered as a city in 1855, but is governed by a charter of 1863, which provides for a mayor, elected every two years, and a unicameral city council. Of the municipal officials, the excise commissioners are elected by the council; the board of health and sinking fund commissioners by the executive and council; and the board of education by the people. The annual income of the city is about $880,000; annual expenditure, $770,000. Population, in 1890, 37,764; in 1900, 52,130; in 1905, 62,509. Consult Hatfield, *History of Elizabeth* (New York, 1868).

ELIZ'ABETH, Cape. See Cape Elizabeth.

ELIZABETH (1533-1603), Queen of England. She was the daughter of Henry VIII. and the unfortunate Anne Boleyn, and was born September 7, 1533. While she was yet in her third year her mother was beheaded. After the mother's execution Elizabeth was sent to the country, where the greater part of her early youth was spent. When Catharine Parr became Queen, Elizabeth, who was a favorite with her, was more often seen at Court; but for some unknown cause she incurred her father's displeasure, and was again sent to the country. Her father died when she was thirteen years old. During the reign of her brother, Edward VI., her life passed quietly and peacefully. She was then remarkable for great demureness, so that Edward used to speak of her as his 'sweet sister Temperance.' Her Protestantism, and the court which was paid to her by the Protestant nobility, caused uneasiness to Mary and her council. At her sister's command she conformed to the Roman Catholic faith, but the insincerity of the conversion imposed upon no one. On the pretext of having been concerned in Wyatt's rebellion, she was sent in 1554 to the Tower. The warrant for her execution was at one time prepared, but her popularity saved her, as her sister's advisers feared an uprising if Elizabeth was put to death. Nevertheless for some time longer she was kept a prisoner at Woodstock. During the remainder of Mary's reign Elizabeth, though occasionally at Court, resided chiefly at her residence of Hatfield House, in Hertfordshire.

When Mary died, November 17, 1558, Elizabeth was twenty-five years of age. Her accession was welcomed alike by Catholics and by Protestants. She then began, amid dangers and difficulties, a reign which, contrary to the expectation of all, was of unexampled length and prosperity. It would be wrong not to attribute to her influence some effect in producing the great changes which, during the next forty-four years, took place in England; but so far as these changes were not produced in the natural course of the development of the nation's power, and so far as they bear the mark of an individual mind, they bear much more the impress of the bold yet cautious judgment and clear intellect of her great minister, Cecil, than of Elizabeth. The essentially Protestant character of her policy was shown at the very beginning of her reign, and in consequence of this a Protestant majority was returned to her first Parliament. In 1559 a new Act of Supremacy was passed. In 1560 Elizabeth concluded a treaty of alliance at Berwick with the Scotch Reformers, who were joined by an English force. The Thirty-nine Articles of the Church of England were published in 1563.

The policy of Elizabeth's ministers, on the whole, was one of peace and economy. No war was undertaken in her reign for the sake of territorial conquest. To strengthen her own throne, Elizabeth assisted the Protestants in Scotland, in France, and in the Low Countries; but she had few open wars. To maintain her own security, and to prevent foreign interference in English matters, was the mainspring of her foreign policy; and she lost no opportunity of weakening and finding occupation abroad for any foreign power that unduly threatened her authority. Her diplomacy was tortuous and swayed by innumerable changes of mind; but she usually attained her ends. Her parsimony was well known and sometimes disastrous. Had she given ample succor to the Dutch as the English nation wished, the result of the war would have been much more advantageous to England. The inadequate provisions and ammunition of the English fleet would likely have led to bad results had the Spanish Armada been placed in more competent hands. However, her parsimony was necessary while the nation was poor. The one great blunder of Elizabeth's policy was the treatment of Mary, Queen of Scots, who, after her defeat by the Regent Murray, at Langside, in 1568, had sought refuge in England, only to become a captive in the hands of the English Queen. Daring neither to execute her prisoner, as several of the ministers advised, nor to release her, in which case she would probably have gone to Spain or France, and by a foreign marriage have forfeited the sympathies of the Scotch and English Catholics, Elizabeth retained her a prisoner, and thus for years gave cause to conspiracy after conspiracy among the English Catholics. For a rebellion incited to set Mary free, the richest and most popular of the English nobles, Norfolk, was executed in 1572. The plots then took on a graver aspect. The assassination of Elizabeth and the placing of Mary on her throne became their object. On the discovery of Babington's conspiracy for this purpose, the popular cry for Mary's death was irresistible, and was joined in by Cecil, Walsingham, and others of Elizabeth's ministers. With reluctance and hesitation Elizbeth consented; and Mary, after long years of confinement, was condemned and executed in 1587.

This led to new evils. The participation of the Catholic party in the plots was punished by persecution. Many suffered under an act passed in 1585 making it treason for a Catholic priest to be in England, and felony to harbor one. These measures were the ultimate means of bringing upon England the most menacing foreign attack which she had suffered. Philip of Spain had long meditated vengeance against England for her aid to the Dutch Protestants against Alva and her freebooting attacks on Spanish commerce. To restore the Catholic faith and to avenge the death of a Catholic queen furnished reasons which were more than pretexts to Philip, who was filled with the desire to promote the Catholic faith. In 1588, after years of preparation, the 'Invincible Armada' sailed from the Tagus, manned by 8000 sailors and carrying nearly 20,000 soldiers. To aid them a land army of 100,000 men was to be transported from the Netherlands under the Duke of Parma. The news roused all England, and every man who could carry arms from eighteen years of age to sixty was enrolled in the forces. The Queen herself rode at Tilbury, energetically encouraging the army. The English fleet under Howard and Drake, gathered on the southern coast, awaited the attack. Superior skill and courage gained the victory for the English; and what they had begun the force of the elements completed. The splendid armada was broken and destroyed before it could join the land army, not a soldier of which ever left foreign ground; while not a seaman of the fleet, save those whom shipwrecks sent, ever set foot on English ground.

The close of Elizabeth's reign was disturbed by a formidable revolt in Ireland under the Earl of Tyrone. The Queen's favorite, Essex, who was sent against him, showed himself utterly incompetent, but the Irish leader succumbed at last to the arms of Lord Mountjoy.

Elizabeth died March 24, 1603, at the age of nearly seventy years. Always parading her wish to live an unmarried life, Elizabeth coquetted with suitor after suitor. She was scarcely more than a child when her flirtations with the handsome Lord Admiral Seymour, the brother of the Protector Somerset, had passed the bounds of decorum. In Mary's reign Elizabeth was flattered by the attentions of her kinsman, the Earl of Courtenay, and she declined the hand of Philibert of Savoy, pressed on her by her sister's council. When Queen she refused with some hesitation the offer of Philip II., who was desirous of perpetuating his influence over England, and she began a connection with the Earl of Leicester which seriously compromised her character. If we credit those sources of information which are found in the dispatches of the Bishop of Aquila, ambassador of Philip II., in London, preserved in the archives of Simancas, not only was the moral character of Elizabeth sullied, but even the quality for which she has ever been most honored, her English patriotism, was mere affectation. These dispatches represent her as proposing to Spain to become a Catholic and to restore the Spanish ascendency in England, if Philip would support her on the throne as the wife of Leicester. That there is some basis of truth in this revelation can scarcely be denied; but, aside from the fact that the Bishop exaggerated, Elizabeth, who was often mendacious, was probably deceiving him. If she really intended to marry Leicester she was prevented by the advice of her ministers, especially of Cecil. Among less distinguished suitors the Archduke Charles of Vienna and Prince Eric of Sweden urged their suit in vain. Petitions from Parliament to the Queen to marry produced only dignified replies that she would attend to the matter when the time came. Catharine de' Medici, Queen-mother of France, intrigued to marry her to one of her sons, Henry of Anjou, with whom she carried on an absurdly ardent courtship for a lady eighteen years his senior. Her last favorite was the Earl of Essex, unworthy but good-looking, whom she had to execute for treason. Nevertheless she never let affairs of State be guided by these favorites, but relied on the wisdom of her ministers, chief of whom were William Cecil, Lord Burghley, and Sir Francis Walsingham, her Secretary of State.

Elizabeth's position gave much scope for the development of the unamiable and ridiculous features of her character. She was vain in dress, rather mannish in demeanor, and not characterized by fine feeling, but in her reign the reckless waste of human life which marked the reigns of her predecessors was unknown. The cruel persecutions of the Catholic seminary priests are in line with the spirit of the times, and are not to be attributed to Elizabeth personally. By her attendants she was feared more than loved. The one quality which never failed her was personal courage; and when she chose, her demeanor was stately and royal. Religion was with her, as with a great proportion of the nation at that time, a matter more of policy and convenience than of feeling or principle. She preferred Protestantism because of early associations, and because it gave her the headship of the Church, freed her from foreign interference, and was more acceptable to her ministers and to the nation.

In the long reign of Elizabeth the true greatness of England began. Freed from the possession of those French provinces which rather harassed than enriched, with little domestic commotion, with no foreign wars, with an almost complete immunity from religious persecution, the nation turned to the arts of peace. An unequaled literature arose. The age that produced Spenser, Shakespeare, and Bacon could not be other than famous. Under Frobisher and Drake maritime adventure began, and the foundations of the British navy were laid. Commerce, from being a small matter in the hands of a few foreign merchants, assumed great proportions. The Exchange of London was opened in Elizabeth's time, and in the charter which she granted to that company of merchants which afterwards took the name of the East India Company may be seen one of the small beginnings of the vast colonial British Empire. The social condition of the people also greatly improved in her reign. The crowds of vagabonds which the monastic institutions had fostered, and which had been increased by the eviction of tenants on monastery lands, died out, or were absorbed in industrial employments. The last traces of bondage disappeared. Simultaneously with the growth of greater comfort and intelligence in the people, Parliament began to assert with greater vigor its constitutional rights. The right of the Commons to free speech, and to initiate all money bills, was steadily asserted, and the right of the Crown to grant monopolies or to issue proclamations having the force of law vigorously assailed, and the reign of Elizabeth may be said to mark the transition from mediæval to modern England. There is abundant original material for a biography of Elizabeth. Chief among the sources is the *Calendar of State Papers* of her reign, especially the *Spanish Series*, ed. by M. A. S. Hume (London, 1892-99). The *Manuscripts* at Hatfield House (Royal Historical MSS. Commission, 1888-95) are most useful; as are the *Burghley Papers*, ed. by S. Hayes (London, 1740) and W. Murdin (London, 1759); *Sydney Papers*, ed. by A. Collins (London, 1746); *Miscellaneous State Papers*, ed. by Earl of Hardwicke (London, 1778); and others. Several of the *Camden Society Publications* are also very useful: *Letters of Elizabeth and James VI.*, ed. by J. Bruce (1849); *Machyn's Diary*, ed. by J. G. Nichols (1848); and *Walsingham's Chronicle*, Camden Miscellany (1847-75). The most important contemporary account of the reign is that by W. Cambden, *History of Queen Elizabeth* (1622), and a continuation by Godwin in Kennet's *Complete History of England* (London, 1740). Consult: Strype, *Annals of the Reformation* (new ed., Oxford, 1824), a standard for ecclesiastical matters; and D'Ewes, *Journals of All the Parliaments of the Reign of Queen Elizabeth*, ed. by P. Bowes (London, 1682), which is indispensable. Among modern authorities the most detailed account of the reign is to be found in Froude, *History of England*, vols. vii.-xii. (New York, 1870); Wright, *Queen Elizabeth and Her Times* (London, 1838), based on private letters of the reign; Creighton, *Queen Elizabeth* (London, 1899), a good popular life; but perhaps the best is A. Jessup's excellent article in the *Dictionary of National Biography*. Strickland's "Lives of the Queens of England" (New York, 1867) contains a life of Elizabeth which is useful as a personal memoir, and Wiesener's *La jeunesse d'Elisabeth d'Angleterre, 1533-58* (Paris, 1878, English translation by C. M. Young, 1879), deals with Elizabeth's youth. For the constitutional development of Elizabeth's reign consult: The works of Hallam, i. ch. 5; Taylor, ii., bk. iv., ch. 5; Gneist, ii., chs. 30-36,

QUEEN ELIZABETH

FROM AN ENGRAVING BY T. A. DEAN, AFTER A PAINTING BY F

passim (full titles cited under GREAT BRITAIN). For economic development, Traill, *Social England*, iii., chs. 11, 12; and Cunningham, *English Industry*, ii., bk. vi.

ELIZABETH (1545-68). A Queen of Spain, daughter of Henry II. of France and of Catharine de' Medici. She was born at Fontainebleau, and although from infancy pledged in marriage to Don Carlos, the heir presumptive to the Spanish throne, afterwards espoused the father of the latter, Philip II. Owing to the cruelty of Philip and the early death of the parties concerned, the story of an attachment between Elizabeth and Don Carlos gradually spread among the people. It has been perpetuated in several stories and romances, and notably in Schiller's celebrated drama *Don Carlos*.

ELIZABETH (1618-80). A Princess Palatine. She was born at Heidelberg, the eldest daughter of the unfortunate Elector Palatine Frederick V., for a brief period King of Bohemia, and of Elizabeth Stuart, daughter of James I. of England. She was educated at The Hague, and was a pupil of William Penn in religion and of Descartes, who dedicated to her his famous *Principia Philosophiæ*. She refused an offer of marriage from the King of Poland, and became Abbess of Herford in 1667.

ELIZABETH, AMÉLIE EUGENIE, ȧ-lĕ′zȧ-bĕt ȧ-mä′lė-a oi-gā′nē-a (1837-98). Empress-queen of Austria-Hungary, wife of Francis Joseph, ruler of the Austro-Hungarian monarchy. She was a daughter of Duke Maximilian Joseph of Bavaria. She was a remarkably beautiful and intelligent woman, and spoke a number of languages. A daring horsewoman and fond of sports, she spent much of her time on her estates or in travel. While on a visit to Geneva she was assassinated by Luccheni, an Italian anarchist (September 10, 1898), and died a few minutes afterwards.

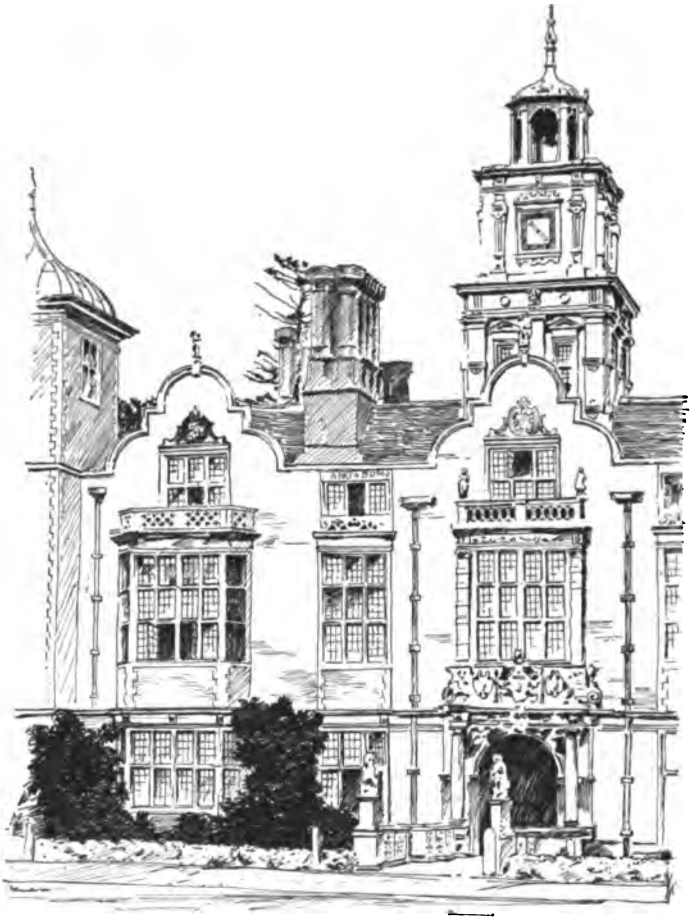
ELIZABETH, PAULINE ELISABETH OTTILIE LOUISE (1843—). Queen of Rumania, known as a poet and novelist. She was born at Neuwied, Germany, a princess of Wied, but after her marriage with Prince Charles of Rumania, in 1869, she identified herself with the Rumanian people. In the Russo-Turkish War of 1877-78 she was untiring in her care of the wounded. The customs and the folk-lore of the Rumanians are the subjects of her poetry, which is full of homely beauty in its expression of nature and life. Under the name of Carmen Sylva she has written a number of books in verse and prose, among them *Leidens Erdengang* (1882, 5th ed. 1899, translated into English by Helen Zimmern as *Pilgrim Sorrow*); *Jehovah* (1882); *Pensées d'une reine* (1882); and *Handwerkerlieder* (1891). For her biography, consult Diederich (Leipzig, 1898) and Roosevelt (London, 1891).

ELIZABETH, PHILIPPINE MARIE HÉLÈNE, called Madame Elizabeth (1764-94). A princess of France, sister of Louis XVI., born at Versailles. She was of a noble and charitable disposition, and, although she had never participated in politics, was prompted by her sense of duty and her affection for her family to leave their country-seat at the outbreak of the Revolution in order to be at the side of her brother, the King of France. Accused of carrying on a correspondence with the royal princes, and of providing them with money, she was sentenced by the Revolutionary Tribunal, May 9, 1794, and executed the following day.

ELIZABETH, SAINT (1207-31). The daughter of Andrew II., King of Hungary, born at Presburg. At the age of four she was affianced to Louis, eldest son of the Landgrave of the Thuringia, and was taken to the Wartburg to be educated under the eyes of the parents of her future husband. She early displayed a passion for asceticism as it was conceived in those days. She despised pomp, avarice, and ambition; cultivated humility, and exhibited the most self-denying benevolence. Her conduct even as a girl astonished the Thuringian Court; but such was the grace and sweetness of her disposition and the excellence of her beauty, that Louis—though her affections seemed to be given wholly to God—still wished to marry her. They were united when Elizabeth was only 14. On the death of her husband in 1227 she was deprived of the regency by the brothers of her deceased husband and driven out, together with her four children, on the plea that she wasted the treasures of her State by her charities. Later she was offered the regency, which she refused. She spent her last days as a member of the third Order of Saint Francis, subjecting herself to mortifications which shortened her life. She was canonized in 1235. Charles Kingsley's dramatic poem, *The Saint's Tragedy*, is founded on the story of Elizabeth's life. Consult Montalembert, *Histoire de Sainte Elisabeth de Hongrie* (Paris, 1836); id., *Life*, trans. by F. D. Hoyt (New York, 1904).

ELIZABETHAN ARCHITECTURE. A term applied to the mixed style which sprang up on the decline of Gothic architecture. By some it is confused with the Tudor style (q.v.), out of which it sprang. The Elizabethan is chiefly exemplified by mansions erected for the nobility in the reigns of Elizabeth and James I., and originated in the first attempt to revive classic architecture, influenced, no doubt, by Holbein, who was patronized by Henry VIII., and furnished several designs in this manner. The distorted forms of Dutch and German late Renaissance are everywhere visible, rather than the direct influence of Italy. John of Padua succeeded Holbein, and built in the mixed style a palace for the Protector Somerset (for which purpose the cloisters of Saint Paul's were taken down), and the mansion of Longleat for his secretary, Sir John Thynne. The curved broken gables, pilasters broken by quoins and bands, and the tormented details are characteristic. So are the vast dimensions of the apartments, the extreme length of the galleries, and the enormous square windows. The ornaments both within and without are cumbrous; the cornices and ceilings wrought into compartments are heavy; in short, the architecture was just in keeping with the dress of the period, rich and gorgeous, rather than elegant, graceful, and comfortable. The following examples of mansions of the seventeenth century may be still seen near London: Holland House, Campden House in Surrey, Bramshill in Kent, Sir T. Willow's at Charlton, the Marquis of Salisbury's at Hatfield, and Knowle, the property of the Duke of Dorset. Others are Burton Agnes, Audley End, Aston, Montacute, Mogus Park, and Blickling. The most eminent architects of those times were John Thorpe, Gerard

Christmas, Rodolph Symonds, and Thomas Holt. Consult: Richardson, *Architectural Remains of the Reigns of Elizabeth and James I.* (London, 1840); Blomfield, *History of Renaissance Architecture in England* (London, 1897); Gosch and Brown, *Architecture of the Renaissance in England* (London, 1894).



BLICKLING HALL.

ELIZABETH CHARLOTTE (1652-1721). A Duchess of Orléans. She was born at Heidelberg, and was a daughter of the Elector Palatine, Charles Louis, and a Hessian princess. Although thoroughly German in temperament and tastes, she was for political reasons married to Duke Philip of Orléans, brother to Louis XIV., in 1671. The fearful devastation of the Palatinate by Louis XIV. (1689), which filled all Europe with horror, was the result of claims to territory which the 'Grand Monarque' made on the strength of this marriage. The extensive correspondence of Elizabeth with her family (7 vols., 2d ed., published in 1867-82) and with Leibnitz throws very interesting side-lights upon the history of the period.

ELI'ZABETH CITY. A town, port of entry, and the county-seat of Pasquotank County, N. C., 57 miles south of Norfolk, Va., on the Norfolk and Southern and the Virginia and Carolina Coast railroads, and on the Pasquotank River (Map: North Carolina, G 1). A State Normal School and the Atlantic Collegiate Institute are located here. The city has a good harbor, large trucking interests, and a considerable trade in cotton, lumber, and fish, oyster cultivation being an important industry. There are saw and planing-mills, shingle-factories, cotton-mills, cotton-gins, flour and grist-mills, iron-works, machine shops, a ship-building yard, and manufactures of bricks, carriages and wagons, mattresses, etc. Under a charter of 1905, the government is vested in a mayor, who holds office for two years, and a municipal council, which elects the mayor as well as the police. Pop., 1900, 6348; 1906 (local est.), 10,000.

ELIZABETH FARNESE, fär-nä'zȧ. See FARNESE.

ELIZABETH ISLANDS. A group of 16 small islands belonging to Massachusetts, lying southwest of Barnstable County and between Buzzard's Bay and Vineyard Sound (Map: Massachusetts, F 5). They form the town of Gosnold, Dukes County, and cover 14 square miles. The islands, of which Naushon and Nashawena are the two largest, have a fine climate and scenery and afford excellent fishing. They are popular summer resorts. Permanent population, in 1900, 164. On Cuttyhunk Island the foundations of the first English colony of New England were laid in 1602 by Bartholomew Gosnold, only to be abandoned the same year.

ELIZABETH PETROV'NA (1709-62). Empress of Russia from 1741 to 1762. She was the daughter of Peter the Great and Catharine I., and was born December 29, 1709. On the death of her nephew, Peter II., in 1730, she suffered Anna, Duchess of Courland, daughter of Ivan V., to ascend the throne. (See ANNA IVANOVNA.) Anna died in 1740, and Ivan, the son of her niece Anna Karlovna (q.v.), an infant of two months, was declared Emperor, and his mother made Regent during his minority. Shortly after this a plot was formed to place Elizabeth upon the throne; the two principal agents in it were Lestocq, a surgeon, and the Marquis de la Chetardie, the French Ambassador. The officers of the army were won over, and on the night of December 5, 1741, the Regent and her husband were taken into custody, and the child Ivan was conveyed to Schlüsselburg. By eight o'clock in the morning the revolution was accomplished. La Chetardic was handsomely rewarded; and Lestocq was created first physician to the Empress, president of the College of Medicine, and Privy Councilor. Elizabeth lacked energy, knowledge, and a love of business and allowed herself to be guided by favorites, corruption reigning at her Court. In order to strengthen her position, she took pains to win over her nephew, the young Prince Peter, the son of her sister, the Duchess of Holstein-Gottorp. She summoned him to Saint Petersburg in the year 1742 and proclaimed him her successor. She took part in the War of the Austrian Succession, and dispatched a large army to the assistance of Maria Theresa, thereby hastening the conclusion of the Peace of Aix-la-Chapelle in 1748. At the commencement of the Seven Years' War she allied herself with Austria and France, and invaded Prussia. Her troops won the battles of Grossjägerndorf and Kunersdorf and raided Berlin, but without any decisive result. Elizabeth died January 5, 1762, before the expiration of the war. She founded the University of Moscow and the Academy of Arts at Saint Petersburg. Consult: Bain, *The Daughter of Peter the Great* (London, 1899); Vandal, *Louis XV. et Elisabeth de Russie* (Paris, 1862); Weidmayer, *Règne d'Elisabeth Petrovna* (Saint Petersburg, 1849).

ELIZABETH STUART (1596-1662). A Queen of Bohemia. She was the eldest daughter of James VI. of Scotland, afterwards James I. of England, and was born at Falkland Castle in Fifeshire, August 19, 1596. After 1608 she resided at Court and took part in the life of the gayest circles. In 1613 she married Frederick V., Elector Palatine of the Rhine, who in 1619 was summoned by the Protestants of Bohemia to be their King. Frederick's forces were defeated by the Catholic Army at Prague, in 1620, and he was driven from his throne. The Palatinate was invaded in 1622 and taken from him, and the Diet of Ratisbon declared the electoral dignity forfeited. With her husband and children, Elizabeth sought refuge in Holland. Frederick died in 1632, but it was not until 1648 that the Palatinate was restored to Elizabeth's second son, Charles Louis, the eldest, Frederick Henry, having died in 1629. She returned to England in 1661, but mingled very little in society, and died February 13, 1662, at the house of Lord Craven in Drury Lane, London. Of her other children, the most celebrated were Prince Rupert (q.v.) and Prince Maurice. Her youngest daughter, Sophia, married Ernest Augustus of Brunswick-Lüneburg, later Elector of Hanover, and became the ancestress of the present reigning house of Great Britain. The best biography of Elizabeth is that by Mrs. Everett Green, in *Lives of the Princesses of England* (London, 1854), which has superseded Miss Benger's *Memoirs of Elizabeth Stuart, Queen of Bohemia* (London, 1824).

ELIZABETHTOWN. A city and the county-seat of Hardin County, Ky., 42 miles south of Louisville; on the Louisville and Nashville and the Illinois Central railroads (Map: Kentucky, E 3). It has flouring-mills, stave and overall factories, and other industrial establishments, and carries on a considerable trade in live stock, grain, flour, fruit, brick, and tobacco. It has an excellent system of water-works. Population, 1900, 1861; 1906 (local est.), 2500.

ELIZABETPOL, yĕ-lē′sȧ-bĕt-pôl. See Yelizavetpol.

ELK (AS. *elch*, Icel. *elgr*, OHG. *elaho*, elk, Ger. *Elch*, whence probably Lat. *alces*, Gk. ἄλκη, *alkē*, elk). (1) The greatest forest-deer (*Alces malchis*) of the northern regions of Europe, Asia, and America, and the largest existing representative of the family. It is known in America as the moose, under which name its characteristics are described. In the Old World it formerly ranged throughout all the forested region north of the mountains from England to eastern Siberia, and it still occurs rarely in Scandinavia, eastern Prussia, Lithuania, and parts of Russia, while it remains fairly numerous in western Siberia; everywhere in Europe it is protected by laws, and in most cases is preserved on royal estates, where a hunt is organized at intervals of several years. It may easily be tamed, and has at various times been put to service, having at one time been trained to draw sledges in the Government's courier service in Sweden. See Moose.

(2) The American "elk," unfortunately so named by the early colonists of the United States, has no resemblance to the European broad-horned deer, properly so called (see above) but rather resembles the red deer. (See Deer.) It is described under its suitable Indian name. See Wapiti.

(3) The Irish "elk" (*Cervus* or *Megaceros giganteus*) is another misnamed deer, which became extinct apparently soon after the advent of man in Europe. Its remains are found not only in the bogs of Ireland, but in caves and superficial deposits of England, Scotland, and the middle parts of the Continent. It was closely allied to the fallow deer, but of much greater size, standing six feet in height, with unusually strong bones about the head and neck, suitable for carrying the enormous antlers which characterized it. These were broadly palmated, and were so widespreading as to measure, in some known instances, almost eleven feet from tip to tip. Its bones have been found associated with the evidences of man's presence showing that it survived his arrival, and that its extermination was probably completed by human agency. Another extinct species (*Cervus Ruffi*), of central Europe, takes a place between this species and the fallow deer. For a description of the different kinds, see Deer, and for illustrations see Plate of North American Deer.

EL-KATIF, el-kȧ-tēf′. A fortified seacoast town of El-Hasa, Arabia, situated on the western shore of the Persian Gulf, a short distance northwest of Bahrein Island. It has an old Portuguese citadel. Population, about 6000.

ELKESAITES, ĕl-kĕs′ȧ-īts, or **ELCESAITES** (named after their reputed founder 'Ηλχασαί, *Elchasai*, 'Ελκεσαί, *Elkesai*, or 'Ηλξαί, *Elxai*; they themselves derived their name from Heb. *heil kesāi*, hidden might). Ebionites, of the second century, living around the Dead Sea and in the Lower Jordan country. They held as the highest authority a work known as the Book of Elkesai, which was known to Origen, Hippolytus, and Epiphanius. The last reports that it was believed to have been revealed by an angel, who was the Son of God. Their system seems to have been a mixture of Christian elements, Jewish legalism, and Essenian asceticism, with a strong taint of astrology and magic. Perhaps the object of the sect was to mingle Judaism and Christianity, so that the Hebrews of that day could embrace the new doctrines without entire repudiation of their old belief. The fullest account of the Book of Elkesai is found in the *Philosophoumena* of Hippolytus.

EL-KHARGEH, el-kär′ge. See Khargeh, El.

ELK′HART. A city in Elkhart County, Ind., 101 miles by rail east by south of Chicago; at the confluence of the St. Joseph and Elkhart rivers, and on the Lake Shore and Michigan Southern and the Cleveland, Cincinnati, Chicago and Saint Louis railroads (Map: Indiana, C 1). It has abundant water-power, and its industries include railroad shops, bridge and iron works, and establishments for the manufacture of carriages, invalid tables, machinery, rubber, paper, bicycles, and musical instruments. The city has a Carnegie library costing $35,000. Population, 1900, 15,184; 1906 (local est.), 17,000.

ELK′HORN. A city and the county-seat of Walworth County, Wis., 54 miles southwest of Milwaukee, on the Chicago, Milwaukee and Saint Paul Railroad (Map: Wisconsin, E 6). It is the centre of a fertile agricultural region, and has large dairying interests and some manufactures. Population, in 1890, 1447; in 1900, 1731; in 1906, 1818.

ELK HORN, Battle of. See Pea Ridge, Battle of.

ELKHORN RIVER. A tributary of the Platte River, Nebraska. The main stream rises in Brown County and the north fork in Knox County (Map: Nebraska, F 1). They unite in Madison County, and the stream flows southeast, joining the Platte in Sarpy County, in the eastern part of the State, after a course of about 200 miles. The Frémont, Elkhorn and Missouri Valley Railroad runs through this valley. The largest tributary is Logan Creek.

EL′KIN, William Lewis (1855—). An American astronomer. He was born in New Orleans, was educated at the Royal Polytechnic School, Stuttgart, Germany, and at the University of Leipzig. His astronomical investigations at the Royal Conservatory, Cape of Good Hope, on the parallaxes of southern stars, which investigations he undertook in association with Sir David Gill, were important. In 1896 he was made director of the Yale Observatory.

ELKINS. A city and county-seat of Randolph County, W. Va., 113 miles southwest of Cumberland, Md., on the Western Maryland and the Coal and Coke railroads (Map: West Virginia, E 3). It is the seat of Davis and Elkins College, and has a hospital and orphans' home. Its chief industries are tanning, brick-making, locomotive and car repairing, and iron-moulding. Under a charter of 1905 it is governed by a mayor, chosen annually, and a unicameral council. Population, 1900, 2016.

EL′KINS, Stephen Benton (1841—). An American capitalist and politician. He was born in Perry County, Ohio, graduated at the University of Missouri (Columbia), in 1860, was admitted to the Missouri bar in 1864, removed to New Mexico, and in the same year was elected to the Territorial Legislature. Subsequently he became a district attorney and Attorney-General of the Territory, and United States District Attorney. From 1873 to 1877 he was Delegate to Congress from New Mexico. Later he removed to West Virginia, from 1891 to 1893 was Secretary of War in President Harrison's Cabinet, in 1894 was elected to the United States Senate, and in 1901 was reëlected. He acquired large business interests in West Virginia, particularly in connection with the coal industry and the railways of that State, and became vice-president of the West Virginia Central and Pittsburg Railway.

ELKS, Benevolent and Protective Order of. A benevolent fraternal society, organized in the City of New York, February 16, 1868, as the outgrowth of a social club known as the Jolly Corks, composed principally of members of the theatrical profession. Its first regular organization was New York Lodge No. 1. The Grand Lodge of the Order was incorporated March 10, 1871, as chapter 19 of the laws of that session, and the past officers of New York Lodge No. 1 were made the first members of the Grand Lodge under the act of corporation. The power to form subordinate lodges was given to the Grand Lodge on March 12, 1871. Charters were issued to New York No. 1 and Philadelphia No. 2. The third lodge was incorporated April 18, 1876, in San Francisco, and subsequently lodges were formed in Chicago, Cincinnati, Sacramento, Baltimore, Louisville, Saint Louis, Boston, Pittsburg, Indianapolis, Providence, Washington, Denver, Cleveland, in the order named, and other cities. During the thirty-five years of its existence New York Lodge No. 1 alone has dispensed $175,000 in direct charity. The Order, in addition to assisting its own members has been a liberal contributor to the relief of suffering in national calamities like the Chicago and Boston fires, the Galveston and Johnstown floods, and the California earthquake disaster; it has since its institution dispensed nearly three millions in such causes. The number of lodges in 1906 was 1030, and subordinate lodges have been established in Skaguay and Juneau in Alaska, Honolulu and Hilo in the Hawaiian Islands, and Manila in the Philippines. Membership in the Order can be acquired only by white male citizens of the United States of the age of 21 and upward, of good moral character; only one lodge can be instituted in any one city, and such city must have a population of at least five thousand, and each lodge is given complete jurisdiction over all residents within said corporation.

One of the unique features of the Order, which attracts the attention of the outside world to its internal organization, is the annual memorial service for the dead of the Order, held by every lodge on the first Sunday in December of each year. This is termed the Sacred Session of the Order. The similar term "lodge of sorrow" is applied only to funerals. The membership in 1906 was upward of 250,000, and the society owned property and cash to the extent of about ten million dollars. The *Elks Antler*, published monthly in New York City, is the Order's official paper.

ELKTON. A town and county-seat of Cecil County, Md., 50 miles northeast of Baltimore, on the Philadelphia, Baltimore and Washington Railroad, and on the Elk River, at the head of navigation (Map: Maryland, O 2). It has pulp and textile mills, fertilizer works, and boat yards. It was first settled in 1681 and first incorporated in 1787. Under a charter of 1890, it is governed by a mayor, elected biennially, and a unicameral city council. Population, 1900, 2542.

ELL (AS. *eln*, Icel. *alin*, Goth, *aleina*, OHG. *elina*, *elna*, Ger. *Elle;* connected with Lat. *ulna*, Gk. *ὠλένη*, *ōlenē*, forearm). A measure of length, now little used. It was originally taken in some vague way from the arm, and hence has been used to denote very different lengths. The Latin *ulna* appears to have denoted sometimes the measure from the elbow to the tips of the fingers, sometimes that between the outstretched hands. The English ell, as a measure of cloth, is equal to five quarters of a yard.

ELLAGIC ACID, ĕl-lăj′ĭk ăs′ĭd (arbitrarily transposed from Fr. *galle*, gallnut, as being a derivative of gallic acid), $C_{14}H_8O_9$. A white crystalline substance contained in the bezoar stones found in the antelope. It may be produced by the oxidation of gallic acid.

ELLAND, ĕl′l*a*nd. A town in the West Riding of Yorkshire, England, on the Calder, three miles south-southeast of Halifax (Map: England, E 3). Its chief industry is the manufacture of woolens. In the neighborhood are valuable stone-quarries. Population, in 1901, 10,400.

EL′LENBOROUGH, Edward Law, first Baron (1750-1818). An English lawyer and jurist, Lord Chief Justice from 1802 to 1818. He was born at Great Salkeld, Cumberland, was educated at the Charterhouse and at Peterhouse College, Cambridge, and studied law at Lincoln's Inn. He began to practice law as a special pleader in 1775, was called to the bar in 1780, and made a King's counsel in 1787. In the year following he was leading counsel for Warren Hastings in the latter's impeachment trial before the House of Lords. In 1793 he was appointed Attorney-General for the County Palatine of Lancaster, and as one of the Crown attorneys assisted at the prosecution in many famous trials, including those of Lord George Gordon and Horne Tooke. In 1801 he was appointed Attorney-General in the Addington Cabinet, and was elected to the House of Commons. In April, 1802, he was appointed to succeed Lord Kenyon as Lord Chief Justice of England, at the same time being raised to the peerage under the title of Baron Ellenborough. His action in entering the Ministry of 'All the Talents' in 1806 gave rise to much adverse criticism, the only precedent of a judge holding political office being that of Lord Mansfield. His fame as a legislator rests for the most part on the 'Ellenborough act'—since repealed—by which ten new capital felonies were created. Although a man of great legal knowledge and sterling integrity, he was quick-tempered and of violent prejudices, characteristics which have greatly affected his standing as a jurist. Consult Campbell, *Lives of the Chief Justices of England* (London, 1857).

ELLENBOROUGH, Edward Law, first Earl of (1790-1871). An English statesman. He was the son of Baron Ellenborough, and was educated at Eton and at Saint John's College, Cambridge, where he graduated in 1809. He was Lord Privy Seal in the Duke of Wellington's administration (1828-29), and in 1841 was appointed Governor-General of India. His policy was displeasing to the directors of the East India Company and he was recalled. The Ministry, however, stood by him, and he was created by the Crown an earl and a viscount. In the Derby administration of 1858 he was president of the Board of Control. Having permitted a dispatch to be made public in which he had administered a severe and caustic rebuke to Lord Canning, Governor-General of India, an outcry was raised against him which compelled him to resign. He remained out of office until his death, though he continued to be the foremost orator in the House of Lords.

ELLENRIEDER, ĕl′l*e*n-rē′dẽr, Marie (1791-1863). A German painter, born at Constance. She studied at the Academy of Munich, under Einsle, the painter of miniatures, and completed her education at Rome, under Overbeck. In 1829 she was appointed Court painter to the Grand Duke of Baden. She resided at Constance, where she died, June 5, 1863. Most of her works were portraits and altarpieces. Among the best are a "Virgin and Child" (1824); a "Saint Felicitas," in possession of the King of England; a "Mary in a Bower of Roses," in the Museum of Karlsruhe. Her heads of women and children are graceful, but her color is gray, dull, and sombre. She also etched twenty-four plates, after Overbeck, Rembrandt, Titian, and others.

EL′LENSBURG. A city and the county-seat of Kittitas County, Wash., 124 miles east by south of Tacoma; on the Northern Pacific Railroad, and on the Yakima River (Map: Washington, E 2). A State normal school is located here. The city has good water-power, valuable mineral deposits in the vicinity, and carries on a considerable trade in live stock and agricultural produce. There are grist and saw mills, a foundry, glove factory, beet-root sugar factory, creameries, etc. Pop., 1900, 1737; 1905 (State est.), 3500.

EL′LENVILLE. A village in Ulster County, N. Y., 26 miles southwest of Kingston; on the Ellenville and Kingston and the New York, Ontario and Western railroads (Map: New York, F 4). It is picturesquely situated in the midst of the Shawangunk Mountains. Ellenville is a popular summer resort, has finely shaded streets and most excellent water. It has a public library and a good high school. It formerly had extensive bluestone quarries, but now its chief industries are manufactures of pocket cutlery and concrete stone and paint works. Pop., 1905, 2872.

EL′LERY, Robert Lewis John (1827—). An English astronomer, born at Cranleigh, Surrey. In 1851 he went to Australia, where two years later he erected an astronomical observatory at Victoria, and from 1856 to 1874 he conducted the geodetic survey of that colony. Under his direction the observatory founded by him (subsequently removed to Melbourne) published about thirty volumes of meteorological and several volumes of astronomical observations. He was president of the Royal Society of Victoria for twenty-three years, retiring from public life in 1895.

ELLERY, William (1727-1820). A signer of the Declaration of Independence. He was born in Newport, R. I., graduated at Harvard in 1747, was engaged as a merchant in Newport for several years, then acted as naval agent for the Colony, and afterwards practiced law. From 1776 to 1786, with the exception of the years 1780 and 1782, he was a member of the Continental Congress, and served on the Marine Committee and the Board of Admiralty. Subsequently he served for several years as commissioner of the Continental Loan Office for Rhode Island, and from 1790 until his death was collector of the customs for the District of Newport. Consult Sparks's *Library of American Biography*, vol. vi. (Boston, 1836).